Integrating Strategic Environmental Assessment And Cumulative Effects Assessment In Canada

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Abstract

In Canada, interest in regional strategic environmental assessment as a framework for assessing cumulative environmental effects is growing. Strategic environmental assessment, and in particular regional strategic environmental assessment, is generally regarded as the preferred assessment framework within which to address cumulative effects due to its broad scale of assessment and its focus on influencing future development. However, very little research has been done to confront the challenges, either conceptually or methodologically, in operationalizing strategic environmental assessment at a regional scale and in assessing cumulative environmental effects in this regional and strategic context. This dissertation advances work in this area by defining a conceptual framework and generic methodology for regional strategic environmental assessment that deliberately integrates cumulative effects considerations.

The research methodology includes a literature review, framework and case reviews, and three sets of interviews with Canadian and international practitioners, academics, and administrators knowledgeable on strategic environmental assessment and cumulative effects assessment issues. The research results are reported in four manuscripts. The first manuscript presents a typology of current approaches to regional cumulative effects assessment. The second manuscript reviews lessons from recent attempts at regional-scale, strategically-focused environmental analysis in Canada that include an impact assessment component and explicit attention to cumulative environmental effects. The third manuscript presents a structured framework for regional strategic environmental assessment in Canada, and the fourth manuscript discusses conceptual and methodological challenges that accompany the integration of strategic environmental assessment and cumulative effects assessment.

Significant findings include that cumulative effects assessment does indeed represent a significant conceptual and methodological challenge in a strategic assessment context and that cumulative effects assessment in this context requires more than simply "adding up" direct effects. Further, this research indicates that the seminal contribution of regional strategic environmental assessment is to determine the pace and nature of future development in a region, including significant regional environmental thresholds, targets, and limits; and to inform decision makers of the broader, the slower-moving, the farther-reaching, and perhaps the more insidious currents of environmental change. Moving forward, there is a need to further develop and demonstrate approaches to cumulative effects assessment in a strategic context, develop a supportive legislative and regulatory framework for regional strategic environmental assessment in Canada, and define the unique contribution of regional strategic assessment in relation to regional planning and management.

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Dedication

This work is dedicated to Bram Noble and Roydon Gunn. Bram, I feel privileged to have been your first Ph.D. student. You were indeed the man on the card. Roydon, you were the other half. Thanks for your love and support, without which I may not have finished.

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List of Abbreviations

AB RSDS	Alberta Environment Regional Sustainable Development Strategy
CEA	Cumulative Effects Assessment
CEAA	Canadian Environmental Assessment Agency
EA	Environmental Assessment
GSH RES	Great Sand Hills Regional Environmental Study
GSH SAC	Great Sand Hills Scientific Advisory Committee
NWT CEAMF	Northwest Territories Cumulative Effects Assessment and Management Framework
PPP	Policy, plan, program(me)
SEA	Strategic Environmental Assessment
TCCMP	Transboundary Crown of the Continent Manager's Partnership
VEC	Valued Ecosystem Component

CHAPTER 1

Integrating Regional Strategic Environmental Assessment and Cumulative Effects Assessment in Canada

1.1 Introduction

Strategic environmental assessment (SEA) is a decision support tool designed to assess the environmental impacts of policies, plans, and programs (PPPs) (Thérivel 2004; Noble 2000; Thérivel and Partidario 1996). Strategic environmental assessment for regions, known as regional SEA, adds a spatial component to this process by evaluating the impacts of PPPs on a variety of valued ecosystem components (VECs) over broad spatial and temporal scales. Currently, one of the most pressing issues in regional SEA concerns the assessment of cumulative environmental effects (Noble and Harriman 2008; CEAA 2000-2003). In Canada, interest in regional SEA as a framework for assessing cumulative environmental effects is growing. In 2008, for example, the Canadian Council of Ministers of the Environment, along with several Canadian provinces, commissioned work to explore the potential to develop structured frameworks for regional SEA. Strategic environmental assessment, and in particular regional SEA, is generally regarded as the preferred assessment framework within which to address cumulative effects due to its broad scale of assessment and its focus on influencing future development (e.g. Thérivel and Ross 2007; Duinker and Greig 2006; Noble 2006; Cooper and Sheate 2004; Bonnell and Storey 2000). However, very little research has been done to confront the challenges, either conceptually or methodologically, in operationalizing SEA at a

regional scale and in assessing cumulative environmental effects in this regional and strategic context. This dissertation advances work in this area by defining a conceptual framework and generic methodology for regional SEA that deliberately integrates cumulative effects considerations.

1.2 Cumulative Effects in Environmental Assessment

Many resource development and land use activities significantly alter physical, social, and economic systems. Some of these changes can be immediate and obvious, such as the social and economic upheaval of remote communities in preparation for reservoir flooding, or a rise or drop in water levels due to river diversions during dam building. Other changes may take longer to appear, or may be difficult to trace or detect. For example, in 1994, 1.3 million sockeye salmon "went missing" from some of the strongest salmon runs in British Columbia's Fraser River watershed (Mulrennan 1998). Despite attempts to determine responsibility, it was ultimately unclear to government officials and scientists whether pressure from commercial fishing fleets, changes in water temperature due to mismanagement of local fisheries, inaccurate population counts, or a combination of factors was to blame for the sudden population crash. On a global scale, climate change as a result of the global warming phenomenon is perhaps the most important cumulative environmental effect of our time. The accumulation of greenhouse gases in the atmosphere went on for many years before warming emerged as a global crisis. What is clear from studying situations like these is that the environmental effects of resource extraction and intense human development activities are often much more complex, extensive, and pervasive than once perceived. This realization is captured in the study of cumulative environmental effects.

While impacts resulting from cumulative interactions undoubtedly have a history as old as humanity itself, "…it is only within the last several decades that environmental researchers and managers have noted their increasing significance" (Shoemaker 1994:1). In the last couple of decades especially, cumulative effects assessment (CEA) has been an ongoing issue in the field of environmental assessment (EA) and is now a topic of increasing concern. Cumulative effects assessment, the practice of systematically analyzing cumulative environmental change (Smit and Spaling 1995; Sears and Yu 1994; Spaling 1994), is now a required component of the federal EA process in Canada, the United States, the European Union, and environmental assessment is practiced in more than 90 other developed and developing countries around the world (Noble 2006). Yet, in spite of recognition amongst the scientific, regulatory, and assessment communities of the importance of CEA to environmental decision making, current assessment tools fail to adequately predict and control the cumulative nature of human development actions and their impacts (Duinker and Grieg 2006; Bonnell and Storey 2000; Hirsch 1988; Beanlands, et al. 1986).

In applications of project-based EA, the most common form of assessment in the family of EA tools, the potential contribution of CEA to decision making is inherently limited by several characteristics of the EA process, including its: (i) ex post facto approach to assessing environmental impacts, including cumulative impacts (Fischer 2007; Fuggle 2005); (ii) heavy emphasis on biophysical (natural) science issues and techniques (Partidario pers. comm. 2009; Noble 2005); (iii) truncated spatial and temporal scales (Joao 2002; McCold and Saulsbury 1996); and its (iv) focus on direct, immediate impacts, rather than also on synergistic impacts, and important interconnections among regionally-significant ecosystem components (Creasy 2002). Because project-based EA is narrowly focused on the project itself, it is often only able to

address simple, linear cumulative effects pathways and is not well equipped to deal with the complexity of cumulative effects issues (Noble 2006). Further, there is no mechanism in project-based EA to address environmental effects that may result from project or effect interactions with other development activities or PPPs. The result is a distinct need for an expanded scope and improved approach to CEA.

In light of these observations, many authors have suggested that CEA may be more effectively practiced within the context of SEA, particularly in a regional context (see for example: Noble 2008; Dubé 2003; Bonnell and Storey 2000). As a higher-tiered assessment process, SEA ideally occurs in advance of project-based decisions, creating the opportunity to better anticipate and potentially avoid some of the environmental impacts that may otherwise be unavoidable at the project level. Regionally-based SEA broadly refers to the application of SEA at a regional scale of analysis and, at least conceptually, involves a scale of spatial and temporal consideration that goes well beyond that which is generally adopted in project-based EA and hence current approaches to CEA. For these reasons regionally-based SEA arguably provides a more suitable context for CEA; however, while the potential benefits of linking CEA and regional SEA are underscored in the literature, the conceptual and methodological integration of CEA and regional SEA is still in its infancy.

Much work has been done to define both SEA and CEA as individual processes but very little has been done to develop a strong conceptual and methodological foundation to support their integration. Internationally, research has tended to focus on the development of empirical frameworks for sectoral applications of SEA in which SEA is applied to a single development sector such as energy (e.g. Marshall and Fischer 2006; Jay and Marshall 2005), forestry (e.g. Noble 2005), land use planning (e.g. Jones et al. 2005), transportation (e.g. Fischer 2002) and so

on. Much less attention has been given to also developing frameworks that reflect the fuller context of regional development. The conceptual development of frameworks for regional SEA is very limited: the few frameworks that do exist tend not to simultaneously emphasize a strategic orientation, a structured assessment component, a regional context, and a focus on cumulative environmental effects. In Canada, advances in CEA-SEA integration have arguably been hindered by the shifting role of regional-scale assessment as a result of changes in federal legislation and the rather ambiguous position of both SEA and regional-scale assessment in the family of Canadian EA tools (Noble and Harriman 2008). Thus, successful integration of CEA and regional SEA depends on two things: (i) the identification of a mutually supportive decision making framework for impact identification and analysis; and (ii) the identification and reconciliation of conceptual or methodological challenges that may prevent the successful integration of these concepts.

1.3 Research Purpose

At present, many of the environmental effects discernable to the public are "regional" and cumulative in nature and need to be dealt with on a proactive or strategic basis. The challenge in EA is to develop an assessment framework that is specifically designed to address these problems. In light of this challenge, the overall purpose of this thesis is to advance the Canadian and international development of SEA by further developing its regional character and its relationship to CEA. Primarily, this involves the characterization and refinement of blended strategic and CEA frameworks.

1.3.1 Objectives

The specific objectives of the research are to:

- Develop a typology of existing project- and strategic-based approaches to regional CEA based on assessment characteristics, functions, and performance expectations.
- Identify the key features of regional SEA and SEA-like case applications and frameworks in order to advance understanding of definitions; drivers; principles; conceptual and methodological approaches; strategies to integrate cumulative effects; and approaches to implementation.
- Develop a conceptual and methodological framework for regional SEA in Canada that explicitly integrates CEA.
- Identify the key challenges to SEA-CEA integration and to the future advancement of regional SEA both in Canada and internationally.

1.4 Research Methods Overview

A number of methods were selected to meet the above objectives, including a literature review, case reviews, and three sets of interviews. The relationship of the methods to each research objective is illustrated in Table 1-1. The table indicates, for example, that the first research objective – to create a typology of approaches in EA to regional CEA – was met based on an in-depth review of the literature, whereas the third research objective – to develop a regional SEA framework – was met by drawing on all of the data sources. Each of the selected methods is further described below and detailed in the thesis manuscripts.

Table 1-1. Supporting methods for research objectives.

Research Objectives			
1.Typology	2.Canadian Case Examples	3.Regional SEA Framework	4.Challenges to Integration
Supporting Research Methods			
Literature Review	Literature Review	Literature Review	Literature Review
	Case Examinations	Academic Interviews	Academic Interviews
	Practitioner Interviews	Practitioner Interviews	Practitioner Interviews
		Administrator Interviews	

Literature Review

An in-depth review of literature was conducted to characterize and explain gaps in knowledge; assess the nature of work already carried out on regional, strategic, and cumulative effects assessment; and further refine the research questions and objectives. The literature review focused on recent conceptual developments, practices and experiences reported in the international journal literature, relevant government publications and guidance documents, and on the "gray" literature including various industry reports and publications, and regional planning documents. Four main bodies of literature were explored, namely:

- Strategic environmental assessment: definitions, concepts, approaches; purpose, principles, benefits; cases and applications; Canadian regulatory context; integration with CEA; need for regional, plan-level methodology.
- Cumulative effects assessment: need to address cumulative effects; EA performance with respect to CEA; definitions, concepts, approaches; integration within EA and SEA; effects- vs. stressor-based approaches.

- Environmental impact assessment: conceptual development; applied, biophysical focus; integration of social, health, and sustainability assessment; issues with practice; need for strategic assessment; need to address cumulative effects.
- Regional environmental management: sustainability appraisal; ecosystem management; scale issues in EA; scenario and futures analysis; regional development and planning.

Framework Examinations

In addition to a general review of relevant conceptual frameworks in the literature, a total of nine frameworks that addressed regional cumulative effects beyond the project scale and above the project tier were identified for detailed examination. These frameworks included a mix of regional and sectoral frameworks and were identified based on available literature and as identified by correspondence with a select few key informants deemed to be knowledgeable of current and recent developments in the fields of cumulative and strategic assessment. The broad features of these frameworks were identified and compared including their purpose, development context, and tier of application, and this information supplemented by interviews with practitioners directly involved in the development or implementation of each framework. These frameworks either formally integrated elements of SEA and CEA or appeared to have a strategic orientation and emphasized the analysis of cumulative effects, and included the following:

- Great Sand Hills Regional Environmental Study, 2007
- Regional Cumulative Effects Assessment: Toward a Strategic Framework, 2004
- Strategic Environmental Assessment of Policy, Plan, and Program proposals: CIDA Handbook, 2004

- The Challenges of Developing Regional Frameworks for Cumulative Effects Assessment: Oak Ridges Moraine, 2002
- A Collaborative Approach to Assessing Regional Cumulative Effects in the Transboundary Crown of the Continent, 2002
- Northwest Territories Cumulative Effects Assessment & Management Strategy and Framework, 2002
- Regional Cumulative Effects Management Framework for Cold Lake, Alberta, 2001
- Regional Sustainable Development Strategy for the Athabasca Oil Sands Area, 1999
- Assessing Cumulative Effects of Saskatchewan Uranium Mines Development, 1992

Interviews

Three sets of interviews were conducted with Canadian and internationally recognized practitioners, academic experts, and administrators with experience in SEA, CEA, and EA in general. "Practitioners" were broadly defined as those with experience in developing and applying regional SEA frameworks, or close approximations thereof; "academic experts" were defined as those contributing to the international journal literature on the topics of CEA and SEA including also regional studies and assessments; and "administrators" were defined as government EA administrators or regulators. A total of 41 individuals were contacted, of which 30 elected to participate in the three sets of interviews. The interview protocol was approved by the University of Saskatchewan Behavioural Research Ethics Board. All interviews were semi-structured and were, on average, 60 minutes in length. Potential interviewees were identified based on demonstrated expertise in the literature, the membership list of the International Association for Impact Assessment, and through 'snowball' sampling. The majority of

interviews were conducted by telephone based on the largely international nature of the interviewee pool. Interview data was analyzed using NVivo 2.0 coding software which is designed to organize large quantities of qualitative data. All data were coded and recoded in an iterative fashion based a heuristic coding system. This type of coding categorizes text in such a way as to illuminate patterns, trends, agreements, and disagreements among the data so that eventually, observations and conclusions may be drawn through the process of inductive reasoning.

1.4.1 Ensuring Quality and Validity of Research

Quality data are reliable, valid, and ethically obtained. In this dissertation, a number of measures were taken to ensure the quality of the data. First, methods of inquiry used in this study are transparent and widely accepted in the field of EA. Second, the data and analysis are based on the views of acknowledged experts and the subjectivity of the researcher and potential biases in interpretation are recognized. The author acknowledges that the chosen lines of inquiry into this subject matter reflect the author's perspective as a social scientist and a planner. It is not claimed that the data or analysis captures 'the world as it truly is,' but rather that they provide a defensible representation of experiences, partially constructed through existing works and the research methodology itself.

Research validity is achieved by ensuring that the research has investigated what it has claimed to investigate. This research adopted common measures to ensure validity, including that steps were taken to build trust and rapport by asking interviewees to describe their background and interest in the research questions before administering the interview schedule; instruments and research questions were drawn from the literature; interview questions were semi-structured

to allow interviewees to express their own perspectives on the questions; and the sample of interviewees was 'fit for purpose' in that it was commensurate with the relatively small pool of experts that currently exists in the relevant fields of enquiry.

1.5 Theoretical and conceptual perspective

Environmental assessment is characterized by a range of theoretical orientations, from applied science to civic science. Cashmore (2004) and Bartlett and Kurian (2000) identify the basic theoretical perspectives in EA which represent a continuum of philosophical beliefs and values. One end of the EA theoretical continuum is characterized by the notion that science is an entirely rational process of objective inquiry and ascribes largely to biophysical and economic methodologies. This perspective has been predominant in EA since its inception in the late 1960s. Based on Cashmore, for example, at one end of the continuum is the belief that the scientific method provides the basis for EA theory and practice. In order to be credible, the EA process must be based on scientific objectives, modeling and experimentation, quantified impact predictions, and hypotheses testing.

At the opposite end of this continuum is the broad theoretical perspective of civic science. Civic science is a broadening of scientific accountability to include citizen "peers" (Reed pers. comm. 2009) and "hosts many ambitions, such as enhancing public understanding of science, increasing citizen participation, diversifying representation in, and promoting the democratization of, science" (Bäckstrand 2003:25). Civic science is a pluralistic model of science (Bagby and Kusel 2003) that tends to emphasize value judgments as well as integrate methodologies more akin to those used in support of policy appraisal and institutional analyses. At this end of the spectrum is the belief that EA is a decision tool used to empower stakeholders

and promote an egalitarian society. In this regard, EA would be deliberative, promote social justice, and help realize community self-governance (Cashmore 2004).

While these descriptions are somewhat extreme interpretations of both science and civic science, and most recent research applications in EA contain elements of both philosophies, they are useful as reference points to explain that the present study falls somewhere in between these two perspectives. This thesis is situated somewhere in the middle of the EA theoretical continuum, where rigorous scientific practice is maintained as a core principle, but the political and social nature of policy and decision-making is also emphasized. This perspective which combines two more moderate EA philosophies – "information provision" and "participation" (Cashmore 2004) continues to gain prominence in EA as it continues to evolve in support of sustainable development goals.

Insofar as this research adopts a civic science perspective of EA, it is based on the belief that the science-politics interface and the research that takes place at this interface needs to be reframed to include a triangular intersection among scientific experts, policy makers, and citizens. Elements of this theoretical perspective are reflected in the methodological approach taken in this study, as well as the nature of the research questions. By definition, regional CEA involves the consideration of many important interconnections that are not easily quantified or understood solely through biophysical research and the economic rationales that previously characterized EA. Additionally, SEA is a process applied to policies, plans, and programs: instruments which typically involve high decision stakes, large system uncertainties, intense value disputes, and therefore fall within the general purview of civic science.

1.6 Thesis Organization

This thesis adopts a "dissertation by manuscript" style. Following the introductory chapter, the thesis is organized into four manuscripts, each of which is presented in a single thesis chapter. The first manuscript (Chapter 2) is entitled "Characterizing Project and Strategic Approaches to Regional Cumulative Effects Assessment in Canada" (Journal of Environmental Assessment Policy & Management, 2008, 10(1): 25-50). This paper steps back from current discussions of assessment frameworks and methodologies to present a typology of regional approaches to CEA based on its multiple characteristics, functions, and expectations.

The second manuscript (Chapter 3), entitled "Toward Structured Frameworks for Regional Strategic Environmental Assessment in Canada: Learning from Similar Framework Applications" builds on the findings of the first manuscript and investigates more closely regional CEA as applied in the context of regional SEA. This paper reviews recent Canadian attempts to develop and apply frameworks that are strategic in nature and regional in scope, adopt cumulative environmental effects as a central focus, and have an assessment component. These frameworks offer an opportunity to reflect upon and learn from recent attempts at regional SEA-CEA integration and the lessons emerging from practice. Most importantly, these frameworks provide important context for the development of a conceptual and methodological framework for regional SEA in Canada which is the subject of the third manuscript.

The third manuscript (Chapter 4) is entitled "A Conceptual Basis and Methodological Framework for the Development of Regional Strategic Environmental Assessment (R-SEA) in Canada." In this paper the acronym 'R-SEA' is introduced as a way to distinguish the framework as applying to regional SEA that incorporates explicit consideration for cumulative environmental effects. Based on interviews with experts, practitioners, and administrators, this

paper traces the development of R-SEA both in Canada and internationally; defines R-SEA and its objectives; describes core and methodological principles; and sets forth a structured yet flexible process to conduct R-SEA. Key success factors and the potential benefits of framework application are also discussed.

The last manuscript (Chapter 5) is entitled "Integrating Cumulative Effects Assessment and Strategic Environmental Assessment: Conceptual and Methodological Challenges." This paper addresses the broader conceptual and methodological issues related to the integration of SEA and CEA. Despite widespread support for integration, there has been little investigation of whether these concepts are well-suited to one another or whether there is ultimately much more to consider in the process of integration. The results of interviews with international experts and practitioners exploring conceptual and methodological challenges to the integration of SEA and CEA are reported, and the implications for practice discussed.

The contributions of the thesis are presented following the four manuscripts. The concluding chapter revisits the main lessons and observations emerging from each manuscript and considers their greater meaning as a body of work. The relevance of these findings is then discussed within the broader research context. The thesis ends with future directions for research.

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CHAPTER 2

Characterizing Project and Strategic Approaches to Regional Cumulative Effects Assessment in Canada

2.1 Introduction

The need éto better understand and assess the cumulative effects often associated with human development actions is well established in the environmental assessment (EA) literature, and cumulative effects assessment (CEA) itself is said to represent a better standard of practice for EA (e.g. Ross 1998; Creasy 2002). Furthermore, recognizing the complexity of pathways and often synergistic nature of cumulative environmental effects, there is also general agreement that CEA should go beyond the evaluation of site-specific, direct, and indirect project impacts to encompass broader regional understandings and considerations of the sources of cumulative environmental change (e.g. Davey et al. 2000; Kennett 2002; Dalal-Clayton and Sadler 2005). Regional CEA has been promoted as means to enable this, providing for a more effective and systematic assessment of cumulative impacts (Grzybowski & Associates 2001; CEAA 2000-2003). However, since regional CEA requires the consideration of often multiple activities across larger spatial scales, many have recognized that it will be most effective when applied above the project tier - at the strategic level of plan and program assessment (e.g. Cooper and Sheate 2004; Duinker and Greig 2006).

That being said, and notwithstanding more than two decades of international commentary, the advancement of CEA beyond the individual project scale, both spatially and

strategically, has been slow to evolve (Damman 2002; Cooper 2003; Duinker and Greig 2006). Arguably, part of the problem is that regional CEA is a flexible concept, varying considerably in form and function from the project to the more strategic contexts of plan and program assessment. There is no single regional approach to CEA; rather there is a range of approaches. Each approach has its own merits that make it suitable to address particular types of cumulative problems at different tiers of assessment, and each can be expected to deliver different types of assessment results. The failure to fully recognize this "one concept - multiple form" characteristic is in part why the EA community has struggled in developing supportive methodological and institutional frameworks for regional CEA (e.g., McLeod Institute 1998; Grzybowski and Associates 2001; Pedynowski 2003). In order to effectively advance regional CEA, there is a need to better characterize the nature, function, and expectations of the range of approaches that currently exist.

This paper presents a typology of regional approaches to CEA based on its multiple characteristics, functions, and expectations. This paper steps back from current discussions of assessment frameworks and methodologies to examine more closely the nature and structure of existing approaches to "regional" CEA. Consistent with recent literature (e.g. DEAT 2004; Noble 2005), regional approaches to CEA are conceptualized from two broad perspectives: environmental impact assessment (EIA)-driven approaches, where emphasis is placed on assessing the cumulative impacts of individual and multiple development projects by extending EIA methodologies over broader spatial and temporal scales; and strategic environmental assessment (SEA)-driven approaches, where emphasis is placed on the CEA of initiatives, plans, and opportunities by adopting an objectives-led approach to assessment and decision making. The intent of this paper is not to propose new methodologies or frameworks for regional CEA

per se, but to explore the distinguishing characteristics of a range of project- and strategic-driven approaches, as well as their opportunities, constraints, and implications for practice in order to demonstrate regional CEA as "fit-for-purpose."

The sections that follow provide context for the regional typology by briefly reviewing the nature of CEA and the need for a more regional approach. This is followed by discussion of a range of EIA- and SEA-driven approaches, illustrated with Canadian case examples that demonstrate the opportunities and constraints to regional CEA. The paper concludes with a discussion of the implications of the typology for advancing regional CEA frameworks and practice.

2.2 Toward Regional Cumulative Effects Assessment in Canada

Conceived initially in the United States under the *National Environmental Policy Act* of 1969, EA originated as an applied science endeavor emphasizing the analysis of biophysical factors over limited spatial and temporal scales (Weston 2000; Cashmore 2004). This was reflected in the typical subject of assessment: an individual infrastructure project and its potential impacts on the local biophysical environment. The concern with such an approach was identified early in the development of EA, in that neither project-based EA nor the institutions in place to manage the process operated at the appropriate scale or hierarchy to address cumulative environmental change (Horak et al. 1983). As Ross (1994: 6) later pointed out, "the environmental effects of concern to thinking people are…not the effects of a particular project; they are the cumulative effects of everything." Subsequently, traditional project-centered EA was conceived by many as narrow, reactive, divorced from the surrounding planning and development context, and ill

equipped to deal with cumulative environmental effects (Duinker 1994; Creasy 2002; Duinker and Greig 2006).

Cumulative environmental effects are effects of an additive, interactive, synergistic, or irregular (surprise) nature, caused by individually minor, but collectively significant actions that accumulate over time and space (Canter 1999; Ross 1998). The assessment of cumulative effects then is the process of identifying and classifying environmental effects and pathways, in order to avoid wherever possible the potential triggers or sources that lead to cumulative environmental change.

The first, formal action to address cumulative environmental effects in Canadian EA rose from the initiatives of the Canadian Environmental Assessment and Research Council, which placed CEA high on its agenda and sponsored several projects and workshops on the subject through the 1980s (Duinker 1994). These initiatives, later combined with parallel developments in CEA guidance and 'good-practice' frameworks (e.g. Kennedy 1994; Kingsley 1997; Hegmann et al. 1999), led to a mandatory requirement for CEA for all project-based EAs conducted under the *Canadian Environmental Assessment Act* (the *Act*). The Canadian Environmental Assessment Agency (the Agency) subsequently released an Operational Policy Statement for addressing cumulative environmental effects (see Duinker and Greig 2006).

To strengthen the role of EA in capturing cumulative environmental impacts, CEA was envisaged to extend beyond the individual project scale to consider broader, regional issues and impacts. For example, between 2000 to 2003 the Agency identified CEA regional frameworks as a priority in Canada, noting that "working at the regional scale can provide proponents, government decision makers and affected publics with a better understanding of…cumulative effects" (CEAA 2000 – 2003) and sponsoring eight major research and development programs

focused on advancing CEA to the regional scale. Regional approaches were thus conceptualized as having the potential to overcome the difficulties and limitations often associated with addressing cumulative effects solely at the individual project level. Further, regional approaches enabled more effective and systematic assessments of cumulative environmental impacts by: reducing the duplication of effort and increasing efficiency in project-based assessments; providing consistent requirements and direction for industry planning and development; providing a framework for administrative and policy coordination; capturing nibbling effects not normally subject to formal assessment; and, enabling strategic choices related to sustainable development (Braat 2001; Gryzbowsky & Associates 2001).

Despite these visions and research developments, the implementation of regional approaches to CEA has been fraught with challenges and the EA community has had only mixed success in developing and implementing regional CEA methodologies and frameworks. In response to these challenges, many have recognized the need for more strategic-oriented approaches, such as those illustrated by the Regional Sustainable Development Strategy for the Athabasca Oil Sands region of Alberta, Canada, (Alberta Environment and Alberta Sustainable Resource Development 2001), and the Cumulative Effects Assessment and Management Framework for the Northwest Territories, Canada (NWT Cumulative Effects Assessment and Management Working Group 2000). However, notwithstanding the development of such institutional frameworks, little seems to have changed since Damman's (2002: 165) observation that "our knowledge and understanding of how to identify and evaluate cumulative effects at the project-specific level is growing... developing cumulative environmental assessment and management frameworks for regional planning issues remains more of a challenge." Duinker and Greig's (2006) review of CEA deployment in Canada, for example, identifies several areas of

deficiency including a sustained focus on project approval rather than environmental sustainability goals and objectives; inappropriate handling of potential future developments (or lack of broad-based, strategic, long-term vision); and a generally weak interpretation of cumulative effects.

On a regional scale, CEA becomes an increasingly complex undertaking that requires a level of conceptualization, analysis, and coordination that is often beyond the scope of individual project proponents, and yet not always within the purview of regional development authorities[1]. The literature increasingly calls for the development of better regional frameworks while at the same time recent practice suggests that we are doing a less than adequate job in CEA in general. Aside from the regulatory constraints to effective regional CEA in Canada (see Duinker and Greig 2006), part of the challenge is that regional CEA is often conceptualized as a single, coordinated framework; however, in principle, the inherent nature and function of regional CEA varies from the project to the strategic tiers of assessment and, at each level of assessment, asks conceptually different questions, plays a different role in the planning process, and delivers different types of assessment results. Advancing the practice of regional CEA thus requires careful consideration of "fit for purpose" and a clear understanding of the range of regional CEAs that exist.

2.3 Conceptualizing Regional Approaches to CEA

In the sections that follow a typology of approaches to regional CEA is presented along with the defining characteristics of each approach. The typology itself is based on CEA frameworks and practices discussed in recent CEA literature and on the results of semi-structured telephone

[1] See, for example, Creasy and Ross' (2005) discussion of the challenges to proponent-based CEA at the Cheviot Coal mine, Alberta (also discussed in this paper); and Law et al.'s (2005) analysis of CEA and monitoring under the Cumulative Environmental Management Association in Alberta's Oil Sands region.

interviews and email administered questionnaires with Canadian and international EA academics, practitioners, and administrators. The literature bridging cumulative and strategic impact assessment served as an initial source of potential contacts, supplemented by the International Association for Impact Assessment's membership directory. A total of 41 individuals were contacted, of which 23 elected to participate. All participants were self-identified as experts in CEA or in some aspect of either project or strategic EA with an interest in CEA. Thus, the number of potential study participants was limited.

Participants were asked a series of semi-structured questions exploring three aspects of regional approaches to CEA: i) the main challenges to regional approaches; ii) the current state of practice of considering cumulative effects assessment in project and strategic-level assessment; iii) the nature and specific characteristics of approaches to regional CEA at different tiers of assessment. The first two categories of questions provided general context for the discussion and understanding of regional CEA. The third set of questions was directed specifically at developing a typology of regional CEA and focused on such concepts as: the driver for assessment; consideration of alternatives; nature of the questions asked in assessment; spatial and temporal bounding; management focus; and relationship to planning and decision making. Emphasis was placed on CEA from the project to the strategic planning level, but stopping short of CEA for policy; in other words, the typology reflects CEAs that have a well-defined spatial or physical dimension or an "on the ground" assessment component.

The typology attempts to capture different *functional* interpretations of a regional CEA. This is perhaps not the *only* classification of regional approaches to CEA, but it is one that serves to differentiate between the purposes and objectives of the various approaches to CEA that operate at different "regional" scales. Two broad classifications are presented here, namely:

1) EIA-driven (project) approaches; and,

2) SEA-driven (strategic) approaches.

EIA-driven approaches capture regional CEA performed for single projects and multiple projects. SEA-driven approaches capture regional CEA performed for single sectors and multiple sectors. This spectrum of approaches, from the single project to the multiple sector, is depicted in Table 2-1 and discussed in the following sections. Based on recommendations of the research participants, and in consultation with the Canadian EA literature, a number of EA applications are also drawn upon to illustrate the various iterations of regional CEA from the project to the strategic level. The cases are not meant to represent examples of 'best practice'; rather they serve to illustrate the functional characteristics of the different types of regional CEA and the relative opportunities or constraints to regional CEA consideration.

Table 2-1. Characteristics of non-strategic and strategic approaches to CEA.

Aspect	**EIA-Driven Approaches**		**SEA-Driven Approaches**	
	TYPE I	**TYPE II**	**TYPE III**	**TYPE IV**
Description	**CEA performed within the context of a single project**	**CEA of multiple projects or multi-component activities**	**CEA of plans or programs for a particular resource or industrial sector**	**CEA of multiple plans or programs, across sectors**
Regulatory Characteristics				
Typical Proponent	Single proponent	Single to multiple proponents	Single industry sector, or government agency responsible for the resource sector	Regional planning or administrative authority or governing body
Trigger	Cumulative effects of project actions on specified valued ecosystem components in the project location	Cumulative and additive effects of multiple projects on a region or regional valued ecosystem components	Cumulative effects of proposed or existing sector-based plans or development initiatives	Cumulative environmental change or regional land use planning initiatives
Types of Alternatives Considered	Proceed or not proceed; technical design and engineering considerations	Alternative development projects; spatial or temporal configurations	Multiple sector-based alternatives driven sector's development vision	Multiple region-based alternatives or scenarios driven by broader regional, sustainability, or policy-oriented goals and objectives
Scoping Factors				
Scope	Restrictive, inward-focused, limited to the stressors and impacts that	Ambitious, outward-focused, taking into account combined	Restrictive, inward-focused, limited to the stressors and effects of	Ambitious, outward-focused, taking into account the stressors and effects of the

	stem from a single project (non-strategic)	stressors and impacts of multiple projects (non-strategic)	PPP of a particular sector (strategic)	combined PPP of multiple sectors (strategic)
Temporal Bounds	Project life cycle defined by project or proponent, considering also past environmental change	Past, present, and reasonably foreseeable future developments in the project's region	Past, present, and reasonably foreseeable sector activities, plans, and programs as defined by the sector's activities (e.g. oil and gas licensing)	Past, present, and longer term futures of regional environments and economies as defined by a regional authority, sustainable development plan, or similar strategy
Spatial Bounds	Site specific, focused on direct on-site and off-site project impacts with continuous dispersion over space. Defined by the single project or project proponent	Often population- or ecosystem-based. Defined by multiple projects within an administrative or physical region	Boundaries of sector initiatives (e.g. forest harvest area) or by sector-claims (e.g. oil and gas licensing and exploration claim)	The planning region under consideration as defined by natural features or by a regional authority - possibly multi-jurisdictional
Cumulative Effects Considerations				
Typical Sources and Pathways of Cumulative Effects	Individual, predicted project actions combined with past and future environmental change	Multiple projects or activities, individually contributing and interacting, and combined with past and reasonably foreseeable impacts of project development	Activities of a single sector, often of a similar type and interacting with other similar sectoral activities, plans, policies, or developments	Activities of multiple sectors, often diverse and interacting with other regional activities, plans, policies, or developments
Typical CEA Questions	What are the likely additive or incremental impacts of the proposed project activity? What are the key stressors?	Are residual effects of many single projects significant? Are the synergistic effects of multiple initiatives or actions overloading natural or social carrying capacity? What is the effects-based contribution of multiple projects?	What are the potential cumulative impacts of each sector alternative? What is the preferred sector-based option given desired outcomes? What are the opportunities and constraints on development?	What are the preferred regional environmental conditions or objectives? What are the potential cumulative impacts of each regional use alternative? What are the opportunities and constraints to current and future developments?
CEA Planning and Management				
Planning Orientation	Individual project planning and evaluation. EIA and regulatory approval. (reactive planning)	Incremental project planning; regional development planning and evaluation. EIA and regional development. (reactive planning)	Large role in industry and sector planning. Plan formulation and initiative prioritization. (proactive planning)	Larger role, related to multi-sectoral planning. Contributing to regional development or environmental management. (proactive planning)
Cumulative Impact Management	Mitigation, monitoring and management of significant individual, project based impacts. Individual proponent responsibility, usually private sector.	Mitigation, monitoring and management of significant individual, project based impacts. Multiple proponent responsibility	Enhance positive impacts, avoidance of negative impacts. Select preferred sector-based development strategy. Risk reduction to the sector and sector environment. Regulate future project development	Enhance positive impacts, avoidance of negative impacts. Select preferred land use alternatives. Focus on risk reduction to regional environment, and regulating future sector activities and development

Role of CEA in the EA process	CEA is treated as one of several layers of information in impact prediction and decision making; embedded in single project assessment and approvals process	CEA is performed to contribute to a larger regional impact understanding that informs decisions about the predicted and acceptable levels of change or impacts due to multiple project developments on regional VECs; assessment remains inherently project-driven	CEA used to inform strategic decisions about the cumulative effects of alternative sector-based development initiatives; CEA is one aspect of a larger sector-based SEA process to inform downstream project activities	CEA may be performed on its own, as an integral part of basis or basis for a regional SEA process; it defines regional thresholds and sets the context for acceptable sector activities
Example	Terra Nova Offshore Oil Field Project EA, Newfoundland, Canada	Cheviot Mine, Alberta Canada	Canada-Nova Scotia Offshore Petroleum Board Misaine Bank Area SEA	Great Sand Hills Regional Environmental Study, Saskatchewan, Canada

2.3.1 EIA-Driven Approaches

The first form of regional CEA evident in practice is rooted in traditional project-based environmental impact assessment. EIA-driven approaches to CEA typically emphasize stressor-based cumulative impact prediction or the likely environmental effects of constructing, operating, and decommissioning new physical infrastructure projects such as roads or industrial plants (see Dubé 2003). Conceptually, there are two classifications of EIA-driven approaches: single project-based CEA where an individual project is the focal point of the CEA, and multiple project-based CEA where groups of projects and their combined effects on the broader regional environment are considered. A key characteristic of EIA-driven approaches is that the need for a major project action or initiative, and the particular type of project, has already been determined. The application of CEA is typically restricted to large scale 'mega-projects' or to those projects that, under the Canadian federal EA system for example, would require assessment by either comprehensive study or panel review. The focus of CEA is to analyze the potential impacts of that project.

Single-project, regional CEA

The single project approach is perhaps the most restrictive interpretation of regional CEA, focusing on the direct, indirect, and cumulative impacts on and interactions with selected environmental components resulting from the actions of a single project development. The objective is to identify how stressors (e.g. siltation) associated with a proposed activity (e.g. dam construction) will affect environmental components (e.g. water quality), and how such impacts might interact with other environmental components or cumulate with other activity-induced stressors within the project's spatial and temporal environment (Dubé 2003). The approach to assessment typically involves a detailed description of the project baseline environment on which to build predictive models and to determine whether project activities will contribute to significant, adverse effects including cumulative effects.

'Regional' CEA under this approach is inherently inward focused, with emphasis placed on the project region, its actions, stressors, and interactions. The regional focus derives from considering, for example, the migratory patterns of a specific wildlife VEC, or the context of a local watershed. The underlying assumption is that all stressors and stressor-effect linkages are known within the spatial and temporal bounds of the project activities. There are numerous examples illustrative of this characterization of regional CEA and its inherent challenges, including the Terra Nova offshore oil field development project, Newfoundland, Canada.

Terra Nova Offshore Oil Field Project EA, Newfoundland, Canada:

The Terra Nova oilfield was discovered on the Grand Banks of Canada's east coast in 1984. Terra Nova is the country's second largest oilfield after Hibernia, with an estimated reserve of 440 million barrels of crude. Petro Canada, the project's main investor, was granted approval for

the Terra Nova project in 1997 following a panel review EA under the Canadian Environmental Assessment Act. First oil was produced in January 2002. Two aspects concerning CEA emerged during the assessment that were particularly contentious: the scope of cumulative effects consideration and the responsibility of the project proponent (Petro-Canada 2006). Public submissions to the project review process emphasized concern for cumulative and synergistic impacts in the offshore area related to fishery depletions, oceanographic changes, seabird hunting, climate change, and transportation. Potential petroleum developments on the Grand Banks were also identified by the public as matters that should be considered in evaluating the project's cumulative impacts. Included were a number of specific projects within the region, as well as broader plans to establish a larger offshore industry. The proponents, in contrast, argued that the scope of cumulative impacts for the Terra Nova project should be confined to specific, planned petroleum projects on the Grand Banks. The assessment panel reviewing the project agreed with the latter, maintaining that the project proponent should not be held responsible for future developments outside their control that may interact with the Terra Nova project in a cumulative fashion. It was suggested during the public review process that an additional comprehensive environmental assessment of all proposed and potential offshore developments would be necessary to consider the changing offshore conditions in light of petroleum developments.

The Terra Nova project is a typical example of regional CEA interpreted narrowly within the confines of an individual project in the sense that "cumulative impacts" are defined as a function of project impacts within the project's spatial and temporal bounds. The outputs of single-project CEA offer little in terms of understanding complex cumulative effects and pathways; rather CEA is embedded in the project assessment process as one of several layers of

information in impact prediction and project-based decision making. Single-project regional CEA is generally restrictive in scope, reactive in terms of planning orientation, and inward-focused on a single project. There is however, a clearly responsible party – the project proponent.

Multi-project, regional CEA

The spatial and temporal boundaries within which single project-based CEA operates are too restrictive to adequately address cumulative effects (Fuller and Sadler 1999). Recognizing that each additional project in a region can represent a high marginal cost to the environment, multi-project approaches to CEA attempt to expand spatial and temporal boundaries to ambitiously address cumulative impacts resulting from a multiplicity of perturbations over time and space. The general principle is to assess the combined impacts of a number of projects, project clusters, or activities within a region with consideration for past and future developments.

In multi-project regional CEA, there may be a single or multiple proponents. The focus of the CEA shifts away from a single project and its localized effects to allow questions of a broader nature related to ecological thresholds and synergistic effects. While the assessment is still inherently project-driven, project decisions begin to depend in part on meeting levels of acceptable change (targets or thresholds) in the regional environment.

Multi-project, regional CEA necessitates information sharing and project knowledge on a scale greater than what is traditionally expected in an EA process. For example, it demands of the proponent an expanded view and understanding of the receiving environment because interactions among project developments across time and spaces are stressed. This type of regional CEA may also require the proponent to seek knowledge of the development plans of entirely different industries, as in the case of the Cheviot Mine, Alberta, Canada.

Cheviot Mine, Alberta, Canada:

In 1996, Cardinal River Coals (CRC) Ltd. formally proposed the Cheviot Coal Mine Project, an open pit coal mine and processing plant in west central Alberta. The environmental assessment of the project was carried out under Alberta's *Environmental Protection and Enhancement Act* and the federal *Canadian Environmental Assessment Act*. Given the diversity of land uses in the region, not to mention the project's adjacency to Jasper National Park, cumulative environmental effects emerged as a major point of concern.

The notion of assessing cumulative impacts over a large area was embraced by the proponent. However, CRC noted two concerns with regional CEA (Logan and Ferster 2002). First, many factors affecting VECs within the region were not solely the result of activities associated with the proposed project. Second, key information essential to the CEA regarding forestry and mining operations within the region (proposed and existing) was unavailable to CRC (Kennett, 2002). Therefore, CRC argued that it lacked the resources to carry out a CEA of all anthropogenic sources or address all potential factors that could influence regional VECs.

The panel reviewing the project ultimately decided not to order production of missing information, and the project received federal approval in late 1997. However in early 1999, following a judicial review sparked by environmental groups citing a failure to fulfill legal CEA requirements, this decision was quashed by the Federal Court of Canada. The project eventually received approval after the preparation of a second CEA study by the proponent to determine effects concerning forestry and related mining activities in the region (Creasy and Ross 2005).

Under the confines of project-based EIA as currently practiced under the *Act*, this is an overly ambitious approach to regional CEA and an approach that cannot reasonably rest with the proponent of any single project. With no formal mechanisms in place to acquire such

information, Kennett (2002) explains, CRC was left to depend upon the "goodwill" of other industries and organizations within the region. The lesson here is that a proponent should be responsible to demonstrate that project-specific impacts are acceptable and will be adequately managed. However, when the focus of attention shifts to sector and regional cumulative effects, a 'higher-order' regulatory authority must be responsible to ensure that the appropriate data for regional CEA are made available. The authority may then address cumulative effects management issues that cannot be adequately dealt with by project-specific measures. This view is echoed by Creasy and Ross (2005), who suggest that cumulative effects require cumulative solutions or a cooperative, multi-sectoral approach to regional environmental management. Multi-project regional CEA is generally ambitious in scope, reactive in terms of planning orientation, and outward-focused on multiple projects. Under current Canadian federal EA legislation responsibility for CEA rests with the project proponent; however, the ability of any single project proponent to adequately assess and manage the cumulative environmental effects of multiple developments and land use activities at the regional scale is questionable. Assessing the cumulative environmental effects of multiple developments at the regional scale requires the efforts of a consortium of proponents, coordinated or led by a regional land use planning or regulatory agency.

2.3.2 SEA-Driven Approaches

Regional approaches to CEA that are confined to the project-level do not serve to address the broader currents of cumulative environmental change or ensure that proposed initiatives generate the desired, rather than the most likely, outcomes. Moreover, adopting a broader spatial or temporal perspective to the CEA process does not necessarily ensure full consideration of

cumulative effects for individual or multiple projects. A regional approach to CEA should involve more than simply expanding assessment boundaries. In a regional assessment there is a unique opportunity to develop more advanced perspectives of the interrelationships between environment and development. In this regard, Clark (1994) and others (see for example: Duinker and Greig 2006; Noble 2005; Quinn et al. 2002; Bonnell and Storey 2000) suggest that cumulative effects are best considered at the strategic level of decision making.

The principal objective of SEA-driven approaches to CEA is to assist the assessment and decision making process by systematically presenting and examining alternatives so as to arrive at the preferred or most desirable course of action. There are three types of SEA applications: (i) single-sector SEA, which refers to sector-based initiatives and impacts (e.g. transportation corridors, oil and gas fields); (ii) multi-sector SEA, which applies multiple sector-based initiatives and broader planning and management initiatives (e.g. land use planning); and (iii) SEA which has no explicit "on the ground" dimension (e.g. fiscal policies). The emphasis here is on single- and multi-sector SEA.

Single-sector, regional strategic CEA

Single-sector, strategic approaches to regional CEA evaluate the potential effects of proposed sector-based initiatives and alternatives in combination with impacts from previous, existing, and future activities and initiatives *of a similar type* in order to identify a preferred sector-based environmental development strategy. The "sector" generally refers to plans and initiatives of a particular industry such as forestry, mining, or energy. Initiatives within these sectors and their alternatives are evaluated within the context of sector-wide objectives for development, existing

environmental conditions, current and proposed plans and priorities, and potential cumulative effects.

Single-sector strategic approaches to regional CEA are typically defined by a jurisdictional boundary such as the legal or administrative extent of sector activities in an area, and subject to a particular sector-based plan (e.g. Saskatchewan's 20-year Forest Management Plans, see Noble 2004). Cumulative effects assessment that is undertaken on a single-sector, strategic basis offers a number of advantages: the ability to address broader, sector-wide issues beyond the scope of individual projects; the ability to prevent or avoid significant environmental effects through the assessment and development of sector-wide policies, plans, or programs (PPPs) before individual project decisions are taken; and the ability to address cumulative effects of sector-wide development. For example, at a strategic level of planning it is possible to develop a broad CEA "superstructure" for a sector that provides the distinct benefit of relieving individual proponents of the need to independently develop a CEA framework—considered to be one of the most complex steps in an EA (Boulden et al. 2001).

Canada-Nova Scotia Offshore Petroleum Board:

The Canada-Nova Scotia Offshore Petroleum Board (CNSOPB), an independent joint agency of the government of Canada and the province of Nova Scotia, is the responsible authority for regulation of the offshore petroleum industry. In 2005, the CNSOPB conducted a SEA of petroleum related activities in the Misaine Bank Area of the Scotian Shelf (CNSOPB 2005). The SEA explicitly considers the cumulative environmental effects, mainly related to activities such as seismic surveys and exploratory drilling. In particular, the Misaine Bank SEA takes into account a number of previous environmental assessments considered by the CNSOPB, and

combined oil and gas industry activities in the review area. The SEA finds potential cumulative impacts of concern related to the chronic oiling of seabirds and to concurrent commercial fishing in the area, both of which could affect benthic communities and fish stocks. The CEA considers a modest range of mostly additive effects. None of the cumulative effects of potential concern are deemed particularly significant, and thus are not specifically addressed in the mitigation plan. The Misaine Bank Area SEA is intended to arm future project-specific assessment offshore with an understanding of potential issues and cumulative environmental change in relation to exploration and development activities. As a single sector, regional CEA the Misaine Bank Area SEA is generally restrictive in scope, inward-focused on the oil and gas sector, but proactive in planning orientation. Thus, there is a responsible party for CEA at the strategic level – a regulatory board – and intent that information gained at the strategic levels will inform downstream project-based EA and development decisions in the assessment area.

Multi-sector, regional strategic CEA

Within the context of multiple sectors, CEA becomes even more synonymous with proactive regional planning, focused on evaluating strategic planning or development scenarios and modeling overall cumulative impacts. In a multi-sector strategic approach to regional CEA, the combined impacts of various PPP initiatives and alternatives within a region, in combination with previous, existing, and future PPP activities, are considered in order to identify the best practicable regional environmental planning or development strategy. Multi-sector assessments are often driven by broader environmental planning or management initiatives, state-of-environment reports, and the initiatives of (and stresses caused by) a wide variety of land uses and infrastructure. In this context, focus often shifts to monitoring the effects of development on

important VECs (e.g. water quality, air quality) rather than on particular stressors of development (e.g. events or methods of construction, and maintenance). As a result, the SEA may address the regional cumulative effects of multiple sectors and not necessarily focus on specific industrial sectors in the region. On the other hand, single-sector assessments may unfold under the constraints and opportunities of multi-sector assessments, which may serve to identify the type of sector development most appropriate for the region in question in light of its contribution to cumulative environmental change. The ultimate objective, Spaling (1994) explains, is to assist decision-making by systematically identifying a preferred option for regional management and development.

Effects-based regional studies have particular value as a source of context, identifying the "state of the region", and thus informing appropriate land use and development activities - they provide the necessary framework to combine the best the elements of stressor-based and effects-based approaches to ensure a comprehensive picture of regional cumulative change (Dubé 2003). There are a number of examples in recent years of truly regional effects-based CEAs, including the Northern River Basins Study (Culp et al. 2000) and the Northern River Ecosystems Initiative (Dubé et al. 2006); both were exercises in developing frameworks for regional cumulative effects monitoring. In the case of the recent assessment in the Great Sand Hills of Saskatchewan, however, regional CEA was an integral part of a proactive SEA framework.

Great Sand Hills Regional Environmental Study[2], Saskatchewan, Canada:

The Great Sand Hills (GSH) of southwestern Saskatchewan, Canada is the largest active dune complex in the region and one of the largest remnants of native grassland in the country. With

[2] This case study is based on the Great Sand Hills Scientific Advisory Committee's 2007 Regional Environmental Study draft final report.

limited cultivation and industrial development, the area has remained relatively intact with a high degree of ecological integrity. Since the early 1980s however, human activity has intensified, particularly in terms of natural gas exploration and development, and the GSH currently hosts approximately 1,500 gas wells with 70% of the region under gas lease. When considering the additive impacts of gas well pads, associated roads and trails, and the concentration of cattle watering holes from livestock grazing activities, the cumulative impact on range health, ecological integrity, and biodiversity has been substantial. As a result, in 2004 the Government of Saskatchewan responded and appointed an independent scientific advisory committee to conduct a regional environmental assessment of the GSH.[3] The assessment was based on an integrated SEA framework where EA and the integration of sociocultural and economic impacts unfolded at the same time as the planning and decision making. As a collaborative initiative involving numerous research groups and discussion with many interest groups, stakeholders, and First Nations, the assessment was intended to provide a comprehensive evaluation of natural, human, and economic capital of the GSH under alternative future scenarios of conservation and land development.

The assessment commenced with a baseline study which characterized the current natural, social, and economic conditions of the region, including an assessment of cumulative changes in selected baseline components over time. As a regional-based approach, the assessment was defined by both ecological and social boundaries, considering geographic relationships, common resources, and activities not only from the perspective of ecosystem components but also from the perspective of policies, plans, land uses, and other interests that may interact with any proposed sustainability scenario for the region. As such, the assessment consisted of two principal spatial boundaries: a 10,016 km^2 'study area' was delineated by the

[3] See http://www.se.gov.sk.ca/GSH/ for background information to the GSH RES

rural municipalities that surround the GSH and was the focus of social and economic assessment; and 1942 km^2 'review' area was delineated by the spatial extent of the dunes and grasslands and was the focus of the biophysical assessment.

Using information derived from the baseline assessment and trends analysis, alternative future scenarios were developed for the region. The impacts of these scenarios were predicted for the year 2020 by means of a cumulative risk and vulnerability analysis, and mapped in a spatially explicit way using geographic information systems. A combined stressor- and effects-based approach to CEA was adopted. For example, the assessment focused on projecting and predicting the combined biophysical, social, and economic impacts associated with gas development and ranching activities under alternative scenario conditions, and on modeling the broader regional cumulative effects of 'surface disturbance' (a surrogate for combined human activity) as indicated by deviation from the baseline conditions. In addition to the overarching concern of surface disturbance, a number of direct and indirect interactions among assessment components and driving forces of change were identified in the assessment, and prioritized for impact management. A preferred sustainability scenario was identified for the region, along with recommendations for the implementation of the preferred scenario including consideration of mitigation measures and monitoring requirements for maintaining the ecological integrity and sustainability.

As in the case of the GSH, most regional strategic CEAs are carried out in the course of initiatives not directly associated with legislated EA requirements (Hegmann et al. 1999; Noble 2000; Duinker and Greig 2006), or under the auspices of regional environmental studies or land use planning. As a multi-sector, regional approach CEA, however, the GSH case demonstrated a relatively ambitious assessment, proactive in terms of planning orientation, and outward-focused

on achieving a broader regional vision. The party responsible for assessment was clear: a government agency or regional planning authority. Less clear, however, is who is responsible for the post-assessment monitoring and management of regional cumulative effects – which are the product of multiple sector-based activities.

2.4 Regional CEA as 'Fit for Purpose'

The typology as presented illustrates that regional CEA is a functionally flexible concept, varying considerably in form from project to strategic contexts. A key reason for this is that EIA-driven approaches to regional CEA are largely defined by the spatial scale of the stressors, and stressor sources (individual and multiple projects); whereas in SEA-driven approaches, regional CEA reflects the spatial scale of the processes (i.e. land uses, industry, regulatory and administrative systems) that control the resources of concern (MacDonald 2000). There are also considerable difference between an assessment that is focused inward on a particular project or sector, as opposed to focused outward on multiple projects and sectors. Regional CEA that is 'inward focused' on a particular project is more likely to focus on direct, observable impacts which can be assigned to a clearly responsible party. In regional CEA that is 'outward focused' on multiple projects or sectors there is a greater opportunity and impetus to focus on synergistic impacts, system-level effects, and interactions among responsible parties. Understanding the characteristics and likely outcomes of each approach is key to understanding the problem-solving potential of regional CEA in a particular application, and will determine the level of satisfaction in applying the tool of choice.

The merits, opportunities and constraints for each approach presented in the typology are varied. EIA-driven approaches to CEA are valuable. They are particularly appropriate when

adopting a stressor-based or a project-focused approach to evaluating cumulative impacts. They are also particularly appropriate in situations where there is a single proponent and development decisions regarding infrastructure construction, operations, and maintenance have already been taken. Due to legislative requirements, much of the existing knowledge and practice of regional CEA in Canada has been built on attempts made in an EIA-driven context.

However, the challenges to regional CEA at the EIA-level are many and different than those at the SEA-level. Effects-based approaches (more congruent with ecosystem management and sustainability objectives) to CEA at the EIA level are generally beyond what can be expected of any single project proponent. An effects-based approach at the EIA level may work from time to time, but it is generally an unrealistic expectation as project proponents, aside from the 'mega project' assessments, typically have neither the mandate nor capability to view questions of cumulative effects at such far reaching scale and scope.

The challenges to EIA-driven approaches are due in part to what Sonntag et al. (1987: 4) identified as the "constraints of tradition," where attempts at broad scale CEA "have almost invariably bogged down in unworkable complexity…even assessments of single projects have frequently proven too complex for application." The traditional approach to assessment is seen as a limitation to effective CEA and management (Duinker and Greig 2006). The problem, Creasy (2002) explains, is that effective CEA requires going beyond a proponent's responsibility to manage its incremental project effects, and having to address impacts from beyond its immediately observable footprint. Creasy (2002) goes on to suggest that further problems arise when individual proponents attempt to address regional environmental management, that is, the effects of activities other than the one that they have proposed. Creasy believes this is because an individual proponent does not have adequate regional influence, and the regulatory approvals

required usually do not affect those surrounding activities. Clearly, a project proponent can only go so far in assessing regional cumulative effects.

In order to effectively address the sources of regional cumulative environmental effects, a more proactive and objectives-led approach is needed than what is currently achieved through conventional EIA-driven frameworks. What is required is an approach that attempts to overcome the reactive nature and difficulties associated with attempting to address environmental issues, particularly cumulative environmental effects, solely at the project level. This requires addressing, in a more holistic sense, the regional context of *desired* development in order to more clearly define the scope of subsequent project and development decisions.

When regional CEA is performed at a strategic level, however, it takes on some significantly different characteristics. SEA-driven approaches are by nature proactive, focusing on desired goals, objectives and alternatives. Interactions among existing and future projects are more likely to be included within the scope of analysis, as are interactions among various sectoral or regional PPP and projects. A wider range of cumulative effects sources and pathways is considered and, because SEA-driven approaches are objectives-led, there is greater attention to enhancing positive impacts rather than just avoiding or mitigating negative impacts. SEA-driven approaches are useful in cases where decision makers wish to consider the range impacts that a combination of plans or projects may produce. Thus, regional strategic CEA is also associated with a greater emphasis on partnerships among various proponents and regional authorities.

Effective regional CEA requires the consideration of multiple scales and extended analytical horizons – characteristics inherently associated with the strategic planning stages of development. As Abraham (1998: 17) observed:

> CEA has been viewed as a correlate of regional or comprehensive, multi-objective planning...uses planning principles and procedures to evaluate various trade-offs among

> alternative…objectives and to select the optimal path from among possible future development scenarios. The aim is to facilitate the decision-making process by systematically selecting a preferred future scenario. The planning approach to CEA is proactive and participatory, and is well suited to the management of cumulative effects. It provides the regional context within which to meaningfully assess the significance of project-specific cumulative effects analyses.

For this reason, the value that CEA can add to decision making in environmental assessment may be more fully realized within the context of SEA, particularly regional scale applications. Such an approach to CEA changes the nature of the CEA performed in that it allows the effects of multiple PPPs and projects to be considered in a proactive, objectives-oriented fashion. In this way SEA-driven approaches ask different questions of CEA than EIA-driven approaches: emphasis is placed on desired outcomes and objectives and the systematic assessment of initiatives and alternatives based on societal values, to inform planning and decision making. Accordingly, SEA- and EIA-driven approaches are associated with different types of inputs, outcomes, and assessment products. A critical challenge, however, is that regional CEA at the strategic level does require a level of administrative, political, and scientific coordination that currently is a rare commodity. Moreover, there currently does not exist in Canada a supporting legislative or regulatory framework that contemplates regional CEA in the manner described.

2.5 Implications for Advancing Regional CEA

This paper set out to identify a typology of approaches that currently exist for regional CEA, with 'regional' extending from the single project to the multi-sector and strategic scales. In doing so, this paper attempted to step back from current discussions of assessment frameworks and methodologies to examine more closely the nature and structure of existing regional CEA approaches. Based on the typology derived, and on the case experiences discussed, it is argued that the choice of CEA framework is a 'fit for purpose' decision. This paper is consistent, in principle, with Duinker and Greig (2006) in that CEA is perhaps a bad conceptual fit with project-based EIA; however, it is stressed here that CEA plays a different role at each tier of assessment, each emphasizing different types of cumulative effects questions and thus generating different types of assessment outputs. It is hoped that the typology presented here will be helpful in focusing project and strategic-level assessments, and in particular the approach to cumulative effects consideration.

In most cases in Canada, CEA is designed within the context of project-based EIA and is the responsibility of individual project proponents. Under this restrictive framework, CEA is inherently a reactive process with a narrowly-defined regional context. It is neither explicitly objectives-led nor is it designed to operate within a broader sectoral or regional planning framework. The common approach is to address the symptoms of individual project development and in some rare instances, cases that include multiple project developments in a particular region, rather than focusing on higher-order strategic initiatives and objectives to assess the sources of cumulative change before irreversible decisions are made. In practice then, many of the disappointments with EIA-based approaches to CEA are not the result of EIA-driven CEA per se, but rather the result of mismatched CEA frameworks and expectations. Where CEA is

implemented under EIA-based frameworks project proponents cannot reasonably be expected to deliver SEA-type results.

Strategic forms of CEA can indeed provide more effective means to address the sources of regional cumulative change than what is currently achieved through conventional EIA-driven frameworks. However, as the scope of analysis expands beyond that of an individual project to include all sector-based activity in a region, CEA ultimately expands beyond the scope of the EIA process, and beyond the responsibility of any single project proponent, and becomes synonymous with strategic and regional environmental planning. Such an approach allows for a combined effects-stressor-based approach to cumulative impact assessment, accounting for the full spectrum and variety of development pressures in a region in advance of new sector-based and individual project development. Currently, however, there are few supporting strategic frameworks for regional CEA in Canada. The result is disappointment when CEA at the strategic level does not trickle down to influence sector and individual project EIA approvals.

In conclusion, there is no single form of regional CEA that best fits all applications. Each tier of CEA has its own merits and limitations. Challenges emerge however, when EIA-driven applications are expected to deliver SEA-type results and when SEA-driven applications do not trickle down to influence project-based actions. As a result, there is a need to conceptually separate the nature and function of CEA at the EIA versus strategic tier, and to develop CEA frameworks on two fronts: first, to strengthen the technical understanding of cumulative effects within the context of project-based impact assessment, at individual and regional project scales, through improving current understandings of VEC and project interactions; second, through creating enabling frameworks such that regional CEA at the strategic level actually trickles down to influence project development decisions and their environmental impacts. The consideration

of cumulative effects should appear in all forms and at all tiers of environmental assessment: one just cannot expect the same types of results to be generated in each case.

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CHAPTER 3

Toward Structured Frameworks for Regional Strategic Environmental Assessment in Canada

3.1 Introduction

Several Canadian jurisdictions are now taking steps to develop structured frameworks for regional Strategic Environmental Assessment (SEA). This is based partly on a growing urgency to reconcile the tools of Environmental Assessment (EA) with the regional scope of many of today's most important environmental issues, including species loss, habitat fragmentation, and the degradation of air, land and water resources as a result of intense human development. However, the concept of regional SEA is not new. Internationally, frameworks for both regional and sectoral SEA have been under development for over a decade (see Thérivel and Partidário 1996; Fischer 2002; Dalal-Clayton and Sadler 2005). Regional forms of SEA evolved in response to a general need to establish sustainable development agendas for sectors and regions and address regional cumulative effects issues, both of which are intimately related and beyond the scope of project-level EA (Harriman and Noble 2008).

Despite considerable growth in international practice, the assessment of regional cumulative effects at the level of policies, plans and programs (PPPs) has only recently attracted serious attention from the environmental assessment community in Canada. In 2008, the Canadian Council of Ministers of Environment, in partnership with the Canadian Environmental Assessment Agency and the provinces of Alberta, Saskatchewan, and Nova Scotia

commissioned a series of reports to develop a conceptual and methodological framework and good practice guidance for addressing regional cumulative effects beyond the project scale and above the project tier (see Noble and Harriman 2008a, 2008b, 2008c). The value-added of such an approach was also a main topic of conversation at a federal regional EA workshop hosted by Fisheries and Oceans Canada in the spring of 2008, and discussions continued in the fall of the same year at a special topic meeting on assessing and managing cumulative environmental effects hosted by the International Association for Impact Assessment.

While a structured, systematic, and federally supported regional SEA framework would be new in Canada, frameworks for regional environmental analysis that include an impact assessment component, have a strategic orientation, and attempt to deal with environmental issues in an aggregated or cumulative fashion, are not. Since 1990, when the Cabinet directed federal departments to consider environmental concerns at the level of PPP development (CEAA 2000), a number of frameworks have been developed across Canadian jurisdictions, each emphasizing to varying degrees impact assessment methodology, a strategic orientation, and a focus on the regional-scale and cumulative effects assessment (CEA). As momentum builds toward the integration of CEA and SEA on a regional basis in Canada, it is an opportune time to reflect upon and learn from recent frameworks that have attempted such integration, and the lessons emerging from practice.

This paper builds on previous work to characterize project and strategic approaches to regional CEA in Canada. Whereas Harriman and Noble (2008) identify and describe two types of non-strategic, regional CEA (single project and multi-project), and two types of strategic, regional CEA (single sector and multi-sector), this paper focuses exclusively on the latter. The purpose of this paper is to move beyond the conceptual discussion that the typology provides,

and to examine lessons from current and recent framework applications in order to better integrate CEA and SEA in a regional context. The paper begins with a brief overview of the development of regional SEA internationally. This is followed by a review of four empirical framework applications in Canada, supported by interviews with practitioners, and the lessons emerging. The paper concludes with a number of broader observations for the future development of structured, regional SEA frameworks.

3.2 Progress in Regionally-Based, Strategic Environmental Assessment

The need to develop frameworks and guidance for regionally-based SEA is well established, and one of the main objectives of regional SEA is to address cumulative environmental effects (e.g., Noble and Harriman 2008a; Noble 2006; Dubé 2003; Bonnell and Storey 2000; Thérivel 1993). Despite this, to date there has been limited theoretical or conceptual development in support of the integration of regionally-based SEA and CEA or the application of blended CEA-SEA frameworks. In Canada, advances in CEA-SEA integration have arguably been hindered by the shifting role of regional-scale assessment as a result of changes in federal legislation and the rather ambiguous position of both SEA and regional-scale assessment in the family of Canadian EA tools. The growing need to address regional cumulative effects issues is now pressing the issue.

Internationally, the development of frameworks for regional SEA, meant to address all forms of development in a region, has been slow, and has been somewhat eclipsed by attention to frameworks for sectoral SEA. For plan-level SEA, attention has tended to focus on development sectors such as energy (Bonnell and Storey 2000), forestry (Noble 2004), transport (Fischer 2002) and land use planning for urban areas (Jones et al. 2005) rather than on comprehensive

regional land use and development plans. Evolution is also slowed in part by the applied nature of the field which traditionally has been an exercise in 'learning by doing,' and is often not led by theory but by practice. In EA in general, conceptual and methodological advances often crystallize only *after* sufficient examples of successful practice are available: this may take considerable lengths of time. The relationship of regional SEA to CEA has also been stymied due to ongoing confusion around CEA itself, and how best to integrate it with both project-based EA and SEA (see: Thérivel and Ross 2007; Noble 2006; Baxter et al. 2001; Ross 1998; Kennedy 1994).

Beyond these issues in practice, the same EA framework can be driven by a range of theories and philosophical perspectives from both the applied and civic sciences[4] resulting in a spectrum of EA characterized by 'one concept, multiple forms' (Verheem and Tonk 2000; Partidário 2000) and a multiplicity of potential theoretical underpinnings. For example, internationally, the practice of regional SEA has evolved in a number of different directions. In England, SEA is often used as an appraisal-based tool to evaluate and improve the existing plans of local planning authorities (Thérivel pers. comm. 2009; Wood and Jones 1997). It is also used to advance 'mega' regional spatial strategies and development futures as far out as 20 years, such as that for the South West Assembly region (2006). This regional appraisal approach is possible in England in large part because of the strong tradition of local and regional land use planning that exists, and the complex of plans and planning processes already in place. In other countries, such as the United States, SEA is interpreted much differently: it is often conceptualized as little more than the typical project-based EA process applied to more than one project at a time. This

[4] Where applied science is broadly understood as a rational process of objective inquiry and primarily the domain of scientific experts (Cashmore 2004), and civic science is broadly understood as a widening of scientific accountability to include citizen "peers" (Reed pers. comm. 2009) and as hosting "many ambitions, such as enhancing public understanding of science, increasing citizen participation, diversifying representation in, and promoting the democratization of, science" (Bäckstrand 2003: 25).

philosophy follows from a general tendency to resist centralized planning or public planning structures which may restrict subsequent private development actions (Draper pers. comm. 2009).

In the Canadian context, despite 15 years of rhetoric, formal SEA application is still in its infancy. For example, in a survey of senior provincial EA administrators, Aura (2009) recently found that certain Canadian provinces do not have any formal SEA practice and, in some cases, there is still uncertainty around what SEA is. The majority of SEAs carried out by federal departments and agencies are policy evaluations, not particularly informative to regional-scale plan-level impact assessment. Regional SEA has sometimes been practiced informally as part of a regional resource or land use planning process (e.g. GSH SAC 2007; Noble 2004), but these examples are relatively few – and even fewer emphasize cumulative effects. Since the imperative remains to integrate regional SEA and CEA, this paper looks to similar past experiences, some of them outside the scope of EA, to try to derive applicable lessons and best practices.

3.3 Methods and Case Study Frameworks

A total of nine frameworks that address regional cumulative effects beyond the project scale, and above the project tier, were identified for review because they either formally integrated elements of SEA and CEA or they appeared to have a strategic orientation and emphasized the analysis of cumulative effects (Table 3-1). These frameworks included a mix of regional and sectoral frameworks. The frameworks were identified through a review of current literature and by correspondence with a select few key informants deemed to be knowledgeable of current and recent developments in the fields of cumulative and strategic assessment.

Table 3-1. Initial framework selection.

Great Sand Hills Regional Environmental Study, 2007
Regional Cumulative Effects Assessment: Toward a Strategic Framework, 2004
Strategic Environmental Assessment of Policy, Plan, and Program proposals: CIDA Handbook, 2004
The Challenges of Developing Regional Frameworks for Cumulative Effects Assessment (Oak Ridges Moraine, 2002
A Collaborative Approach to Assessing Regional Cumulative Effects in the Transboundary Crown of the Continent, 2002
Northwest Territories Cumulative Effects Assessment & Management Strategy and Framework, 2002
Regional Cumulative Effects Management Framework for Cold Lake, Alberta, 2001
Regional Sustainable Development Strategy for the Athabasca Oil Sands Area, 1999
Assessing Cumulative Effects of Saskatchewan Uranium Mines Development, 1992

The broad features of these frameworks were identified and compared, including their purpose, development context, and tier of application, and this information supplemented by interviews with practitioners directly involved in the development or implementation of each framework. A total of 15 individuals were contacted, 11 of which were interviewed. Participants included internationally recognized SEA and EA practitioners. Interviews ranged from 35 to 80 minutes in length, but typically lasted about an hour. Participants were asked a series of semi-structured questions exploring: (i) the 'story' behind the development of the framework; (ii) definitions adopted in the framework; (iii) conceptual and methodological approaches (iv) feedback on the framework; and (v) challenges in implementation. Particular attention was given to the role of cumulative effects within each framework. All data interview data were coded using NVivo software for qualitative data analysis.

Following a preliminary review of the frameworks and interview results, it was realized that attempts at combined regional and strategic assessment in Canada are few and no two frameworks identified were the same. Formal and informal case applications were of a diverse nature, comprised of a mix of normative and empirical frameworks aimed variously at different PPP levels, and included both regional and sectoral scopes of application. The empirical frameworks variously emphasize environmental planning and management; institutional coordination; policy development; and environmental impact assessment. Some of the empirical frameworks, although developed with a particular application in mind, were never implemented.

To bring clarity to this diversity, the results presented in this paper focus on the four frameworks and empirical applications deemed most relevant to the development of structured frameworks for regional SEA in Canada, namely the:

- Great Sand Hills Regional Environmental Study;
- Transboundary Crown of the Continent Manager's Partnership;
- Alberta Environment Regional Sustainable Development Strategy; and, the
- Northwest Territories Cumulative Effects Assessment and Management Framework.

3.3.1 Case Study Frameworks

The above frameworks are identified as the best examples or approximations of regional SEA in the sample, in that they are empirical and applied; plan or programme tiered; regional in scope; strategic by nature; focused on cumulative effects; and involve an assessment-style component. In particular, all four frameworks are associated with a particular geographic region and inclusive of the activities of multiple sectors and types of disturbances. Each of these cases and frameworks is discussed elsewhere in the literature (see for example, GSH SAC 2007; CEAM

Secretariat 2003; Quinn et al. 2002; Alberta Environment 1999). The intent here is not to review these in detail but rather, a brief description of each case is given below and case characteristics are further summarized in Table 3-2.

Great Sand Hills Regional Environmental Study:

In 2002, the Saskatchewan provincial government commissioned the Great Sand Hills Regional Environmental Study (GSH RES) in response to ongoing concerns over the impacts of economic development on a sensitive grassland and sand hills ecosystem. The purpose of the GSH RES was to address the nature and underlying sources of cumulative environmental change in the region and to identify desirable futures and outcomes. The overall approach to assessment was based on a structured SEA methodological framework (after Noble and Storey 2001) and on underlying SEA principles and characteristics. The study was enabled by use of MARXAN, a spatial decision support model based on a GIS framework that features a cost function to determine the total cost of impact in terms of biodiversity loss, or the total cost of conservation in terms economic or social loss. This approach enabled CEA to occur beyond the constraints of individual project-based initiatives in the region, many of which were not subject to any form of impact assessment. The study area covered a large geographic area (approximately 10,000 km^2) and was multi-tiered, considering biophysical, socioeconomic, cultural boundaries, common resources and geographic relationships, as well as the reach of existing policies, plans, land uses and interests that had the potential to affect any proposed land use scenario for the region. The RES was completed in 2007, and is still under provincial government review for implementation at the time of writing this paper.

Transboundary Crown of the Continent Manager's Partnership:

Initiated in 2001, the Transboundary Crown of the Continent Manager's Partnership (TCCMP) was established to design and assess a regional framework to examine cumulative effects within the Crown of the Continent ecosystem, a shared region of the Rocky Mountains between two western Canadian provinces and the United States state of Montana. The strategic framework itself was developed to assist more than 20 government agencies responsible for land management in Alberta, British Columbia, and Montana to address cross-boundary cumulative effects issues. The Mistakiis Institute based at the University of Calgary, Canada, provided secretariat and research support for the initiative. The framework was built around the ALCES (A Landscape Cumulative Effects Simulator) model - a stock and flow simulator of system dynamics. ALCES operates by establishing relationships, pathways, and rates of flow between regional entities or 'stocks' of interest (including for example, land use and land cover types), and then simulates the change in those entities over time (Quinn et al. 2002). The overall intent in using ALCES was to enable land managers to consider the cumulative effects of current and future (cumulative) development in the region in a proactive manner. The process used regional scenario analysis, and emphasized an iterative and adaptive modeling and feedback process with the goal of continuous improvement to the modeling process and the process of regional collaboration.

Alberta Environment Regional Sustainable Development Strategy:

In 1999, in response to increasing development pressure in the Alberta oil sands, the Alberta Environment Regional Sustainable Development Strategy (AB RSDS) was established. Anecdotal evidence of environmental change was being brought forward by communities that were noticing changes in, among other components, air quality, water quality, and the health of

regional wildlife. To proactively address some of the cumulative environmental effects issues that the new development would create, a team of internal Alberta government working teams was formed, assisted by an ad hoc multi-stakeholder group that included First Nations, industry, and environmental groups. The First Nations stakeholder groups were asked to identify key regional cumulative effects. The government researched these issues to compile available science and identify data gaps. The results were brought back to the stakeholder groups who were then asked to rank issues in order of management priority. A list of 72 different issues was compiled, organized into media themes (air, water quality, land disturbance, etc.), and prioritized using a three-tiered ranking system to indicate management importance. A five year work plan was begun, working first on issues for which management actions would have the most immediate effects and on issues that the team knew least about. This framework was developed by combining numerous ideas, models, and approaches developed elsewhere, including regional planning in BC, the CEAMF in the NWT, methodologies developed by CEAA, and ideas from EA literature on cumulative effects.

Northwest Territories Cumulative Effects Assessment and Management Framework:
Based on a recommendation of the 1999 Diavik Diamonds Project Comprehensive Study Report, in 2002 a regional steering committee was formed, and with the help of other groups in the NWT, determined what kinds of actions and mechanisms would be required to assess and manage cumulative effects.

Table 3-2. Case study framework characteristics.

	Regional Scope	Strategic Orientation	Assessment Component	Multi-Sector	Focus on cumulative effects
Great Sand Hills Regional Environmental Study (2002)	Defined by social and ecological boundaries taking into account VECs and other PPPs that may interact with proposed scenarios. Study area spreads across 8 rural municipalities.	This is an informal regional SEA, based on a standard step-wise process for SEA and adopting a systematic approach to environmental assessment.	Based on strategic scenario analysis using MARXAN. It compares multiple alternative future development scenarios, assessing their potential impacts on the environment.	Includes consideration of ranching, oil and gas, recreation and tourism, First Nations traditional land uses, and other potential land uses.	Does not consider CEs explicitly, but rather implicitly. Because so many types of developments and impacts are assessed in tandem as "surface disturbance", this amounts to a cumulative effects study.
Transboundary Crown of the Continent Manager's Partnership (2001)	Encompasses a shared region of the Rocky Mountains between Alberta, British Columbia, and Montana.	A higher-level partnership (coalition of public land mangers) aimed at generating more and better strategic information to aid planning and provide context for the assessment of individual project proposals.	Cumulative effects assessment performed using a computer model known as ALCES (A Landscape Cumulative Effects Simulator).	Managers Partnership comprised of more than 20 government agencies representing myriad public and private interests. An international, inter-agency working group. Forestry, oil and gas, transportation, settlements, and agriculture are key.	Examination of landscape level cumulative effects within the Crown of the Continent Ecosystem. A common need was identified to assess ecosystem-wide processes and issues related to land management in pursuit of sustainable development for the region.
Alberta Environment Regional Sustainable Development Strategy (1999)	North-eastern Alberta, Regional Municipality of Wood Buffalo.	In anticipation of greater than $12 billion worth of new capital investments in the oil sands region, the RSDS identified and prioritized environmental management objectives for the region as a guide to new development.	Does not follow a standard environment assessment process but rather takes an issues based approach. Environmental issues are identified and prioritized based on the anticipated trends of future regional development.	Considers effects of existing and anticipated oil and gas development in combination with public demand for land access, forests, wildlife, water, etc. Partners included First Nations, industry, environmental groups, and government agencies.	Focused on the cumulative effects of oil and gas activity combined with other regional development effects on land, water, and air. Fourteen cumulative impact themes developed and addressed through a staged action plan.
Northwest Territories Cumulative Effects Assessment and Management Framework (2002)	Applies to the Northwest Territories and its regions.	Makes broad, proactive recommendations to decision-makers to facilitate ecological integrity, and sustainable community development within a sound environmental management framework. Also links with transboundary initiatives.	Includes environmental assessment in accordance with applicable legislation. Where the potential for cumulative effects is identified during screening, referral to the partnership for a more strategic assessment may occur.	Includes consideration for all of the elements of land use development including mining, oil and gas corridor development, and First Nations traditional land uses.	Formed in recognition of the cumulative effects of continued resource exploration and development in the Northwest Territories and the desire to prevent, assess, and manage potentially adverse cumulative effects.

The initiative, known as the Northwest Territories Cumulative Effects Assessment and Management Framework (NWT CEAMF), was driven by biophysical concerns related to cumulative effects on wildlife, water quality, air quality, and socio-economic concerns such as employment saturation in First Nations communities. The framework is comprised of nine components and programs, some of which were in existence prior to the CEAMF or had been contemplated, namely: a vision and objectives; land use planning; baseline studies and monitoring; research; an audit and reporting function; project EIA; regulation and enforcement; information management; and team coordination. The framework is operationalized based on the "Blueprint for implementing the CEAM strategy and framework in the NWT and its regions," which contains recommendations to decision makers addressing each of the framework components, regional plans of action, traditional knowledge and community capacity building (Government of Canada 2003: 1).

3.4 Results of the Case Study Framework Reviews

In the sections that follow, a number of prominent themes emerging from the framework reviews and participant interviews are presented. Attention here is focused on those issues or themes identified that appear to be common across frameworks, rather than on context-specific issues. While the context of application was quite different from case to case, many similar insights emerged in the development and application of the frameworks that are important to advancing regional SEA in Canada.

3.4.1 Regional Vision

In all of the cases examined, establishing a regional vision for future development and the roles that regional stakeholders would need to play in achieving that vision was found to be of paramount importance, albeit in different ways. In the case of the GSH RES, there was a recognized need to address cumulative impacts and larger scale processes of change in the region based on a number of years of unresolved planning and land use conflicts in the region. For example, local ranchers had noticed a rapid increase in surface disturbance due to gas pipeline development, and across the region, incremental surface disturbance had begun to threaten biodiversity and encroach upon active sand dune areas. On a provincial scale, there was recognition that the Great Sand Hills required some degree of protection but that continued economic development was important to the future of the region. Thus, the challenge was to construct a broadly supported regional development scenario or vision that would help to address long-standing regionally-significant environmental issues and balance the simultaneous need for environmental protection and economic development.

In the case of the TCCMP, the need to establish a collective vision for the future of the Crown of the Continent ecosystem and develop complementary management regimes across inter-provincial and international jurisdictions was the driving force behind the formation of the Manager's Partnership. The impetus for this framework came from land managers themselves in Alberta, British Columbia, and Montana who observed cross-boundary cumulative effects issues (e.g. integrity of border crossing habitats, transboundary water issues, wheat management, First Nations issues, rural residential development, growth in industry and tourism). Land managers were aware of what was taking place within their jurisdictional boundaries but wanted to be able to understand what was happening in adjacent jurisdictions. While collectively there was

agreement that ecosystem protection was of principal importance, the greater challenge came in translating this strategic vision for the ecosystem into operational terms. One of the coordinators of the TCCMP explains:

> No one had the mandate to do this (implement the strategic vision) because they (the land managers) all have individual jurisdictional mandates. So when they would try to be involved in the project they'd have to track in a kind of round about way, 'Is there something in my enabling legislation that speaks to the need to look to the full scope of a problem?' And there wasn't, or the connections were really weak. And in fact, 'it's a liability if I sign off. I don't want to be held to this (strategic level) standard because this standard is not in my legislation and I could get sued for that.'

Despite the potential difficulties of translating strategic directions into operational terms—an issue discussed later in this paper—experience with the NWT CEAMF similarly underscores the need to establish a common regional vision. In this case, while the need for a broad collective vision is acknowledged and there is shared concern for the effects of ongoing regional resource development – including biophysical concerns related to cumulative effects on wildlife, water quality, air quality, and socio-economic concerns such as employment saturation in First Nations communities – there are also a number of competing visions for development. The result is a lack of a common strategic vision, hampering the overall effectiveness of the CEAMF.

In the case of the AB RSDS, the challenge was not so much to establish a common regional vision as it was to adopt a scope of vision that included unexpected development trajectories. One of the main challenges to the AB RSDS was that development began to outpace its ability to address even existing issues, let alone get ahead of new issues. This implementation gap was due to the slow pace at which the AB RSDS process unfolded and also because of an assumption that

regional change and development would continue at the current or past rates. One government administrator observed:

> I had thought that when we did this process we would, five years later, have a handle on most of these questions, and then ten years later, we'd virtually have them all to bed, and that basically we'd just be monitoring progress and implementing the system. Doing the work as a partnership has the benefits of having buy-in at the table, but is negative in the sense that it takes quite a while to do that process. And quite a while to gather the scientific studies and also quite a while to get agreement on what the studies showed and things like that. So, one of the difficulties was continual delay to the process. You've downloaded all this responsibility to stakeholder groups rather than government.

The AB RSDS illustrates that regional SEA must not only be future-focused but also dynamic in that its assumptions and products should be updated and adapted on an ongoing basis in order to respond to shifting regional conditions.

3.4.2 Predicting Effects

An ongoing debate in SEA concerns the role of impact prediction and the extent to which it is useful or even possible in a strategic setting. Impact prediction has been a foundational element of project-based EA since its inception; however, strategic assessment contexts are typically associated with a higher degree of uncertainty than project-level assessment (Fischer 2007; Partidário and Fischer 2004). In each of the frameworks examined there was considerably less emphasis on precise prediction of impacts and increased emphasis on approaches to establish thresholds, limits, and targets for future development. In other words, the emphasis was on

establishing ‘goalposts’ to guide future regional development, rather than on making precise impact predictions per se.

In the case of the GSH RES, for example, the goal of modeling was ultimately to balance the competing objectives of environmental protection and economic development rather than to predict specific stressor-VEC responses into the future. The framework was designed to systematically evaluate the cumulative effects of multi-sector land uses and surface disturbances under different future scenarios. Using MARXAN and asking ‘what if’ questions about potential future change, the assessment team created future images of the region accounting for natural change and cumulative development change so as to identify a preferred future and the means to achieve it. One of the practitioners involved explains:

> When analyzing scenarios, we were trying to find appropriate targets whereby cumulative disturbance could happen but we would still meet our conservation targets and maintain connectedness across the landscape. When we found those targets that allowed us to maintain a degree of ecological connectivity then we were happy with the targets.

While the team was successful in identifying a preferred regional development scenario, this approach was very exploratory in that the team did not know at the outset what valued ecosystem components (VECs) or impacts were most significant, what the real drivers of change in the region were, or if those drivers of change were the primary reason for observed impacts. These factors represent, in part, a shifting environmental baseline; a phenomenon that has always been present in impact assessment but which can be a particular challenge in regional, strategic exercises that extend over several years. This shifting regional baseline also presented challenges in the implementation of the AB RSDS framework, as noted above. Similar to the GSH RES, the

AB RSDS framework focused heavily on establishing environmental thresholds, indicators, and minimum standards of performance as a basis for future monitoring, and to guide future regional development.

The TCCMP also found that a shifting regional baseline created difficulties, ultimately leading to an approach that focused on establishing regional development thresholds, limits and targets. The TCCMP framework was built around the ALCES model. Once ALCES is populated with data, it can compose various land use development scenarios, although it is not spatially explicit. In other words, it generates output for the ecosystem a whole but is unable to disaggregate results to a specific region within the ecosystem. This was troublesome for land managers who wanted to know what might be predicted within their own jurisdiction. The model was also found to be too broad with so many scenario possibilities that it was difficult for land managers to pinpoint what it was that they specifically wanted the model to produce. The number of jurisdictions involved, the different scales of data, and different standards of reporting, along with different levels of understanding around the issues, made the data standardization process extremely complex. Only a small portion of data was known and this known data was heavily supplemented with trajectories, predictions, and educated guesses – large data gaps were very time intensive to fill. In addition, stakeholders were not always forthcoming with data and were often uncomfortable about knowing the results of predictions.

Thus, over time, the focus of the TCCMP shifted away from using predictive modeling, and placed greater emphasis on identifying what to track within the region, including those VECs that are potential indicators of ecosystem health. In this way, environmental targets could be set and land managers could find ways to meet them that made sense within their own jurisdictional context. This was found to be a much easier way to address regional cumulative

effects rather than focusing on predicting specific impacts on specific VECs in a complex regional environment. Land managers also felt more comfortable communicating common development goals to their jurisdictional counterparts rather than having to respond to or explain the potentially controversial results that could come from strategic modeling exercises. Two members of the administrative team for the TCCMP explain: "They're worried that maybe it will change their job, but not in a positive way. 'Is that going to give a political message that I don't want to hear, or that my bosses don't want to hear?' We think a lot of the failure (of the modeling exercise) was driven by not wanting to know the answers to some of these things."

3.4.3 Strategy vs. Operations

In regional SEA there is a challenge to consider and, if possible, create connections to operational level initiatives; connections that are realistic in terms of the capacity and mandates of the planning, management, institutional, and regulatory structures and initiatives that are already in place for that particular region. One interviewee involved with the AB RSDS observed that there is a need for a government-led regulatory strategy for an initiative like the RSDS to fit within. In addition, a standing regional governance system composed of local authorities, stakeholders and the public was seen as important to ensure adherence to the regional development strategy and provide a basis for CEA. The same interviewee stated: "In order to have real success, the strategic decisions made about cumulative effects have to be enabled and administered by somebody, a transparent and accountable regional body."

Part of the challenge, however, is that strategic level assessment can be a confusing process for those that must translate strategic visions and goals into operational decisions. Similarly, progress toward strategic goals can be hard to track. For example, the research support team for

the TCCMP attempted to explain to stakeholders that: “We’re not doing something that’s project specific. It’s not going to be industry specific and it’s not going to be focused down on one particular landscape piece. The (ALCES) model is used for something that’s broader than that.” At the same time, in order to focus the modeling exercise, the administrative team needed the land managers to describe “the kinds of management decisions you need this for.”

Understandably, this created confusion among participants. A member of the research support team acknowledged: “When everyone’s primary interest is to deliver their particular operational mandate, it’s challenging to step back and keep focused on broader areas and issues, and you can’t blame the stakeholders because it’s the nature of their responsibilities and they don’t have much time.” The research support team was challenged with bridging high level information and strategies, and land managers’ issues which were project specific. Without clear recognition of what exactly strategic initiatives will help stakeholders to achieve, success in regionally based SEA may be elusive. Similar challenges were evident in implementing the NWT CEAMF. As one EA administrator noted:

> It can be difficult to determine what constitutes progress at the strategic level because progress is not always tied directly to operational changes. Some CEAMF partners see the framework as functioning as it was intended to. The actions and mechanisms required to assess and manage cumulative effects have been identified and progress has been made on a number of fronts. However, most people see progress as being very slow; so slow and laborious as to be virtually ineffective, to the point that participation in the whole initiative has dropped off. This slow rate of progress contributes to problems of ignorance, apathy, and complacency.

Further evidence from the NWT CEAMF case underscores that what is envisioned or hoped of a strategic process is not always reflected in terms of delivery capability at an operational level. One interviewee explained that in the near future, the NWT CEAMF will likely undergo a name change. The term "assessment" in the name may be dropped and the initiative would simply be known as the Environmental Management Framework for the North West Territories. The CEAMF was initially created by bundling together existing relevant environmental management tools and initiatives in the region, and adding several others. Over time, it was found that the strategic assessment portion of the CEAMF framework created certain expectations that were described as "perhaps much bigger and broader than the reality." In reality, cumulative effects issues are mainly addressed as they come up through the NWT regulatory environmental impact assessment process; there is no particular strategic methodological approach to CEA, and the group continues to struggle to do CEA well even at a project level. The name change is explained as an attempt to re-establish more realistic expectations for CEA in the region.

3.4.4 Timing the Assessment

The relevance of a regional, strategic assessment initiative lies not only in relating its outcomes to the operational realities in a region, but also in ensuring the assessment process is both sensitive and responsive to important 'windows' for decision-making. In other words, not only must the purpose of the process be clear, the *timing* of the process is critical. The window of opportunity to affect change in a region should in turn influence the design and scope of the regional, strategic initiative. For example, in all of the cases reviewed, interviewees felt that uncertain future conditions were not grounds to delay the assessment process; that it was more

important to proceed with the assessment in a timely fashion, making and documenting assumptions where appropriate and utilizing existing sources of information as much as possible. Uncertainty was viewed 'chronic,' and not something that should prevent progress on regional cumulative effects issues. More specifically, there was a recognized need to balance the time it takes to gather new information, or fill data gaps, against the general pace of environmental change in a region. As one interviewee involved with the NWT CEAMF explained:

> The window of opportunity to affect change is closing. We have an opportunity in the Northwest Territories to get it right and to do it differently, but that window of opportunity isn't going to stay open forever, and I think that's certainly part of my frustration with SEA and I think its part of the frustration that others have with the process too. We're going to have to get it right pretty soon.

A senior member of the TCCMP administrative team expressed similar concerns:

> I think one of the unfortunate things is recognizing how long it takes to address something that's over an entire landscape, and just even just seeing how long it takes to move anything forward with this partnership. There are a lot of people involved, and it's a slow process, and so something like this – to actually address cumulative effects on a strategic level – is a huge undertaking. And while you're trying to do something, the clock is ticking…this jurisdiction has an election, that jurisdiction has a budget cut, this jurisdiction is going into budget planning, you know, the ground is constantly shifting. And not just shifting a little bit. Incrementally, huge shifts. And you see that there are different political things happening on the landscape that are preventing everybody to be able to commit all at once, and the landscape itself is also changing.

In the case of the GSH RES, roughly four years and millions of dollars were invested in a regional, strategic assessment process to identify a preferred regional development path for the region. The issue around timing in this case was different from the above two examples in that the issue was not so much timing the assessment to coincide with an important decision window; rather, a provincial election near the end of the assessment, and the resulting shift in policy directions for the province, appears to have delayed the implementation of the assessment results. When asked to describe what feedback had received after completing the GSH RES, a member of the assessment team replied:

> None… we did receive some feedback internally from government, but not necessarily on the nature of the entire process or the entire framework. There was this letter in the news, in the Regina Leader Post, where they were speaking with (a senior EA administrator in Saskatchewan) about this and another wider public consultation process going on in the Great Sand Hills… I guess with the change in government, this project got caught in the middle. It didn't really get the feedback and review we were hoping for. But the latest I heard is that it will be moving forward now.

While timing issues such as changes in government can be unpredictable, there is a need to have SEA unfold in a timely fashion (Thérivel 2004), ideally synchronized with the decision making and planning processes it is meant to inform (e.g. Cooper and Sheate 2004), and regional SEA must be particularly sensitive to both the pace of environmental change in a region and the key windows of influence on decision-making.

3.4.5 Nature of Cumulative Effects Assessment

Each of the four frameworks adopted a unique approach to defining and assessing regional cumulative effects. Common, however, was recognition that CEA in a regional and strategic setting requires more than simply 'adding up' individual impacts and stressors – it demands a focus on pathways of cumulative change and adopting a more ecosystemic or holistic view of the environment. Each of the cases emphasized to some degree:

- understanding cumulative pathways of change, synergistic effects, and the protection of key ecosystem relationships, functions, and services;
- understanding regional stressors and drivers of change, as well as environmental effects; and
- a holistic view of the environment, with intent to protect the 'integrity' of the regional ecosystem.

Both the GSH RES and the TCCMP processes focused on cumulative pathways of change, synergistic effects, and the protection of key ecosystem relationships, functions, and services in the region. For example, the TCCMP focused on a region of the Rocky Mountains shared between two Canadian provinces and one U.S. state; an ecosystem with a very large physical geography. The framework was based on a shared understanding that there were a number of incremental changes within the ecosystem that needed attention (e.g. fragmentation of border crossing habitats; transboundary water issues; rural residential development; growth in industry and tourism activities), but that most important was to understand the combined and synergistic effects of individual management decisions on the ecosystem as a whole. The GSH RES was similar in that it focused on a large, sensitive ecosystem and understanding complex environmental and economic relationships within the region. This was apparent in the approach

to CEA: first order impacts identified through MARXAN spatial modeling exercise were intuitively linked by the assessment team to second, third, and fourth order impacts. The GSH RES exercise attempted to go beyond direct, first-order impacts to also include higher-order impacts, and the total potential impact of various alternatives on both biodiversity and economic development with the region.

One of the key questions to emerge from the AB RSDS process was whether to adopt an effects-based approach or a stressor-based approach to CEA (see Dubé 2003). The AB RSDS team currently favours a stressor-based approach because it was found that effects are simply too difficult to measure. A member of the AB RSDS team explains that "in modeling effects, many assumptions are required and modeling outputs often do not reflect eventual realities." The AB RSDS team at first endeavoured to select environmental indicators that could act as a "canary in a mine," – able to detect effects long before a large scale environmental change could occur. It was found, however, that natural variability complicated these efforts and that it was very difficult to distinguish 'safe' effects levels from effects levels that required management intervention. At present, emphasis is shifting to informing the public, proponents, and regulators about the key issues in the region and encouraging "bold action" on the "stressor side of things." Continual improvement to operations is still seen as important but an effects-based approach is regarded as being relatively reactive, compared with a stressor-based approach. The RSDS team found that managing environmental stressors was an important part of the strategy to proactively address cumulative effects issues.

Both the NWT CEAMF and the GSH RES adopt a more holistic view of the environment than is generally taken in project EA, based in part on a recognized need to protect the integrity of the regional environment as economic development activities continue to unfold. For example,

in the NWT, the CEAMF partnership was created based on a recommendation of the 1999 Diavik Diamonds Project Comprehensive Study Report to facilitate a common approach to addressing the cumulative effects of development across the region. In the GSH, the RES was needed to ensure some level of protection to preserve the integrity of the sand hills and surrounding natural grassland ecosystem. Notably though, one interviewee observed that there is still a tendency to compartmentalize the environment at the regional level. He shares a perspective that developed while carrying out regional, strategic assessment in partnership with First Nations:

> We criticize project EA for thinking in a very compartmentalized manner and say 'you need this regional perspective.' But when we take that regional perspective, we still compartmentalize things. But a holistic view is very different. There's no separation. You can't separate spiritual places from the health of a species. It's just seen (by First Nations) as Mother Earth, sacred land. And that's perhaps the highest level of thinking you could have in cumulative effects. How you operationalize that, I'm not sure. How holistic can it be before you make it meaningless, and how compartmentalized can you be without losing the holistic picture?

Thus, in all of the cases examined, there is demonstrated awareness of the need to address CEA in a more comprehensive fashion when working on a regional scale and at a strategic level. This is in contrast to CEA in project-based EA. In project-based EA, due to its foreshortened spatial and temporal scope of application, CEA is often limited to focusing on: (i) direct, additive or interactive pathways of change, and first-order effects; (ii) project-related stressors and their effects on VECs of the immediate environment, rather than an expanded (regional) view of stressors and effects and the relationships among them; and (iii) a piecemeal view of the

environment, whereby the environment is addressed in a piecemeal fashion according to distinct media "silos" such as air, land, and water.

3.4.6 Purpose of Assessment

One of the most interesting findings that emerged from the cases examined is that regional, strategic assessment processes are primarily about helping to set an appropriate pace for regional development (e.g. by setting either targets for development and/or limits on development) based on knowledge of ecological, social, and economic thresholds, values, and capacities. This includes determining an appropriate or acceptable mix of types of development, and taking measures to influence both the positive (by enhancing) and negative (by mitigating) externalities of development on the environment. Speaking about managing the pace of development, a senior EA administrator in the NWT explains:

> The bottom line is that, to me, anyway, cumulative effects management is about pacing development. It's about getting to the point where we can actually say 'not right here, not right now.' We need to be able to say 'this area is too important for a diamond mine because of its ecological values.' Or 'we don't need another diamond mine right now because job opportunities and the economy is saturated.' You need to be able to get to the point where you can make those kinds of decisions as a society.

In other words, the overriding concern is to arrive at shared, scientifically-supported judgments about the desired pace of development in a region based on the potential absorption rates of the environment and society.

In the case of the GSH RES, the assessment was primarily about determining the right proportion of particular types of economic development and land use protection in the region,

based on scenario analysis. Prominent economic land uses in the region including ranching, oil and gas development, tourism were balanced with the need to protect local populations or occurrences of rare flora and fauna, high quality habitat for species of interest, and intact examples of all biophysical habitat types in the region. By using MARXAN, it was possible to explore many different combinations of uses and levels of protection, ultimately leading to the identification of the most desirable scenario, with an acceptable level of both economic development and conservation.

Similarly, experience in applying the TCCMP framework suggests that with respect to the purpose of regional assessment, the process of regional SEA is at least as important as the product. Although in this case, the purpose of assessment was to arrive at common goals toward ecosystem management, the research support team for the TCCMP noted that one of the main benefits of the partnership was that relationships were established and maintained, easing day-to-day operations in the region:

> There was recognition on the part of each of these folks that, for example, 'I'm going to try and manage for grizzly bears, and I can't do that in my national park, so how do we do that in a more collaborative way?' So I think there was that kind of higher level, strategic stuff, but there was also just immediate stuff, you know, like 'who has resources available for fire fighting today?' Who can I pick up and talk to right now on the phone?' So it's kind of a range of those things.

Thus, the purpose of assessment went beyond seeking standards for coordinated management of the region; it evolved to also include the creation and maintenance of operations-based relationships that would make the shared strategic goals possible. Based on these observations, the purpose of assessment when applied at a strategic level and on a regional scale appears to be

qualitatively different from that of the traditional project EA which was conceived as a process to inform a single major decision about a single project: 'go or no go.' The case evidence indicates that strategic assessment is not just assessment above the project tier, but assessment that adopts a strategic mind-set.

3.5 Implications for Structured Regional SEA Frameworks in Canada

While the need for regional SEA is well established (Noble and Harriman, 2008a; Harriman and Noble 2008; Gryzbowski & Associates 2001; Bonnell and Storey 2000; Thérivel and Partidário 1996; World Bank 1996), less commonly discussed are the specific attributes of the conceptual and methodological frameworks that support practice in this area. Harriman and Noble (2008) recently established that approaches to regional CEA in both strategic and non-strategic contexts should be 'fit for purpose;' matching expectations for the process with appropriate elements of methodological design. Based on an investigation of four empirical frameworks that depict many of the attributes of regional SEA, a number of observations can be ventured concerning the implications for structured regional SEA frameworks. While these observations are based on four Canadian frameworks and lessons emerging from their application, arguably, these observations are equally applicable to the advancement of frameworks for CEA-SEA integration elsewhere.

First, one of the primary goals of regional SEA should be to establish a regional vision and bring focus to regionally-significant environmental issues. In each of the cases examined, a framework for regional, strategic CEA was pursued primarily due to an overwhelming need to develop a shared vision for sustainable development into the future. While reasons for carrying out regional SEA will vary from case to case, the four cases reviewed suggest that regional SEA

should adopt, as a touchstone for good assessment, identifying and addressing regional-scale issues and other select issues or trends (perhaps local or national) that may be of regional relevance. In this way, regional SEA can provide a unique, 'birds-eye view' on development – a view that is sometimes missing in the policy landscape – and provide an important point of reference for subsequent programmatic or project-based EA, which tends to be narrowly focused on environmental issues of a sub-regional scale.

Second, a primary focus of CEA in regional SEA should be to establish 'goalposts' to guide future development, based on the best available knowledge of environmental thresholds and limits. SEA is ideally designed to tier forward to project development in order to influence decisions about the nature of development, but the strategic context complicates impact prediction. While uncertainties and data gaps can be addressed by making and recoding careful assumptions, and predictive modeling will always play an important role in impact assessments of all types, the cases examined suggest that in regional SEA there should ultimately be less emphasis on predicting impacts with a high degree of precision and more emphasis on setting targets for regional environmental protection and development.

Third, steps must be taken in regional SEA to ensure that the process and products of regional, strategic assessment are relatable to operational mandates. The case evidence reveals just a few of the problematic aspects of translating strategic directions into operational directives including: keeping up with a sometimes rapidly shifting environmental baseline; coordinating disparate resources and policies in support of strategic initiatives; and ensuring that expectations for the process remain realistic. Based on findings such as these, one of the key challenges for regional SEA practice in Canada will be to expand the scope of CEA beyond the inherent

limitations of project-based approaches to reflect the realities of assessment in a regional environment; while at the same time, keeping the regional SEA process practicable.

Fourth, regional SEA must recognize and respond to important 'decision windows.' Important decision windows may be interpreted as either a particularly sensitive phase in regional development perhaps due to mounting development pressure or perhaps a key point for decision making in a political process that may have significant implications for the future of the regional environment. For regional SEA that is reasonably well connected with other regional policy and plan making processes, as in the case of the NWT CEAMF, this may be less of a challenge: strategic decisions may be more easily connected with other key regional decision processes. However, for regional SEA that occurs fairly independently of other policy or decision making processes, as in the case of the GSH RES, the relationship of the assessment to other policy and plan making initiatives in the region must be clearly articulated at the outset and monitored and re-evaluated as the assessment process unfolds.

Fifth, the case evidence strongly indicates that the approach taken to CEA in regional SEA must be more than a 'sum of parts.' In particular, the regional scale of assessment requires attention to important connections and relationships in the ecosystem, as well as adopting a more holistic view of the environment. Evidence from the TCCMP, the AB RSDS, and the GSH RES indicate that a more sophisticated view of CEA, and an aggregate view of environmental effects, is necessary to build on current understandings of direct, first-order impacts. Some of the ways to address CEA in regional SEA include: adopting an issues-based approach to assessment that includes consideration for both stressors and effects (AB RSDS); aggregating both classes of stressors and effects and examining the relationships among them (TCCMP); and identifying key elements of the regional environment that require protection and generating alternative economic

development scenarios to support those needs (GSH RES). These approaches suggest that some innovation in CEA at a strategic level in Canada is underway – albeit outside of any formal SEA system.

Finally, the seminal contribution of regional SEA may be to influence the nature and pace of regional development, in light of conservation and/or sustainable development goals. The case examples suggest that in regional, strategic assessment, it is possible to progress assessment beyond dichotomous interpretations of the past, wherein development was pitted against conservation, and the ultimate product of an assessment was a 'yes' or 'no' decision, with or without conditions. While impact prediction will always remain an important aspect of the overall assessment, the point of regional SEA is to ensure that overall, the environment and society benefits more than it would have without the strategic initiative, and set to a course to the future.

3.5.1 Conclusion

In conclusion, the challenges of carrying out CEA in a strategic context have only just begun to be articulated, and should be explored further. The evidence presented in this paper indicates that there are a variety of approaches to building frameworks for regional environmental assessment that have a strategic orientation and attempt to deal with environmental issues in an aggregated, or cumulative fashion. While each of the frameworks investigated was designed as 'fit for purpose' based on the regional context and was therefore appropriate to the situation and questions at hand, the success of each was also limited in certain respects by unexpected challenges related to working in a strategic context. The role of assessment within each of the

empirical frameworks was also relatively weak with only the GSH RES based on a structured assessment methodology.

Without structured frameworks, the development and efficacy of CEA-SEA integration or regional SEA will remain difficult to track. Perhaps the most important lesson that can be taken from the present study, however, is that regional SEA does appear to be the most appropriate framework within which to address regional cumulative effects issues, *if* the primary goal is to influence the nature and pace of development in support of regional sustainable development goals. The challenge ahead is to continue to improve our understanding of the regional environment and the cumulative forces that act upon it; to develop and pursue our visions for sustainable regional development; and to adjust our assessment strategies and methodologies to reflect the realities of the considerable task at hand.

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CHAPTER 4

A Conceptual Basis and Methodological Framework for the Development of Regional Strategic Environmental Assessment (R-SEA) In Canada

4.1 Introduction

Procedurally, project-based environmental assessment (EA) is concerned about the most likely impacts of a proposed development, and finding ways to mitigate those impacts so that they are deemed acceptable; it does not ask whether the proposed undertaking is the most appropriate form of development, or whether the cumulative environmental effects of such development are in conflict with broader environmental goals or desired future conditions. In Canada, there is now a collective understanding that EA must go beyond the evaluation of site-specific, direct and indirect project impacts to include also issues of broader regional, cumulative and higher tiered policy, plan, and program (PPP) development significance (e.g. Harriman and Noble 2008; Duinker and Greig 2006; Dubé 2003). This cannot be achieved, however, simply by suggesting the results of regional environmental studies be integrated into current project-based principles and practices, as implied by section 16.2 of the *Canadian Environmental Assessment Act.* There are no formal requirements or linkages to ensure this will happen. Neither can it be achieved based on the current model of Strategic Environmental Assessment (SEA) in Canada, which is limited to the federal level, divorced from regional planning and downstream project-based

assessment, and provides little methodological guidance for the consideration of cumulative environmental effects.

Rather, what is needed is a new approach to EA designed to systematically evaluate the cumulative effects of multi-sector land and resource uses and surface disturbances under different future scenarios – creating images of the future state of development, including cumulative change in a region, and asking 'what if' questions in order to inform the development of regional sustainability strategies and PPPs. Arguably we have the knowledge and tools to do this, but the EA community has failed to integrate current regional, strategic and cumulative effects assessment models and frameworks in a common and systematic methodological approach. One of the most significant challenges at hand is what Sonntag and others (1987: 4) refer to as the "constraints of tradition". That is, EA beyond the project scale, and in particular the assessment of cumulative environmental effects, has been slow to evolve and innovative solutions that differ from the status quo have not been forthcoming. The move toward a more regional and strategic form of EA has not been a logical progression of methodological development and institutional evolution but rather a series of ad hoc responses to the shortcomings of project-based EA (Noble and Harriman 2008a). To adopt Duinker and Greig's (2006) advice for advancing the state of cumulative effects assessment (CEA), what is required is a revolution in how we undertake EA, not an evolution.

In order to support a more spatially relevant and strategically oriented approach to EA, in early 2008 the Canadian federal government through a federal regulatory improvement initiative, the Canadian Environmental Assessment Agency, and the Canadian Council of Ministers of the Environment, along with various provinces, identified 'regional strategic environmental assessment' (R-SEA) as a concept warranting further consideration and development. In

principle, R-SEA is based on a re-conceptualization of the relationship between the assessment of cumulative environmental effects and SEA. It is a process designed to "systematically assess the potential environmental effects, including cumulative effects, of alternative strategic initiatives, policies, plans, or programs for a particular region" (Noble and Harriman 2008b: 16). R-SEA is more than expanding the boundaries of EA 'up' to a higher tier or 'out' to encompass a broader geographic area; it represents a different way of approaching the interrelationships between environment and development decision-making at a regional scale.

Several R-SEA-type initiatives are now underway or planned at federal and provincial levels, and the concept itself was the focus of much attention at the recent International Association for Impact Assessment's special workshop on CEA held in Calgary, Canada in November 2008, and at a December 2008 workshop of the federal government's Major Projects Management Office; however, at the same time there is no consistent framework to aid collaborative work on the subject. As such, this paper presents a conceptual basis and methodological framework for the development of R-SEA in Canada. The intent is neither to add another layer of regulatory EA nor to introduce new terminology for the 'same old' practices but to provide a foundation for integrative EA in support of strategic planning, CEA, and environmental decision-making in a regional context.

The paper is presented in six sections, including the introduction. Section 4.2 presents a state-of-the art-review of EA in Canada, and the need for R-SEA. Section 4.3 outlines methods of investigation and the basis for the R-SEA framework. Section 4.4 suggests underlying principles for R-SEA and Section 4.5 presents a methodological framework to guide R-SEA application. The paper concludes with a brief discussion of the potential benefits of applying this framework.

4.2 Canadian Environmental Assessment: State-of-the-Art

Why propose R-SEA concept and methodology at this time? Simply put, the current state of EA in Canada demands it. First, Canadian federal EA has evolved from an ambitious to an inherently restrictive process. Throughout the 1970s and 1980s, for example, a number of highly ambitious EAs were undertaken as area-wide reviews, public review panels, and concept-based assessments (e.g. Mackenzie Valley Pipeline Inquiry, 1974-1977; Beaufort Sea Hydrocarbon Review, 1982-1984; Atomic Energy of Canada Limited's Nuclear Fuel Waste Management Concept, 1988-1994). In part, these ambitious assessments were a reflection of the scope of EA requirements at the time – a Guideline Order with a reach that included any initiative, undertaking, or activity for which there was a federal decision-making authority. Similar area-wide approaches characterized many provincial EAs, including Saskatchewan's Churchill River Basin study that examined the implications of a program of water development projects on the Churchill River system, and the Bayda Inquiry into whether uranium mining should continue in the province.

By the early 1990s, however, EA emerged with a strong project orientation. The federal Guideline Order had the force of law but was still not formally incorporated in legislation. In some cases EA was undertaken after project development has already commenced. In response, the *Canadian Environmental Assessment Act* was introduced to make EA more rigorous and systematic, ensuring that impact assessment was applied early in the planning stages of development. At the same time, the *Act* also limited the reach of EA to project-based decisions. Broader regional and concept-based reviews became largely divorced from formal EA, and a more focused and restrictive project-oriented EA process emerged.

Second, the higher-order, more strategic form of EA introduced in the early 1990s to address those PPP initiatives that had been excluded from the federal impact assessment process has been slow to evolve, and its value added has not been fully realized (Noble 2009). This new form of EA, now commonly referred to as SEA, was touted as the solution to addressing area-wide and cumulative effects problems early in the decision making process so as to allow sustainability benefits to trickle down to the project level (see Harriman and Noble 2008a; Thérivel 2004; Fischer 2002). In practice however, SEA in Canada has lacked guidance, is perceived by many as an *ad hoc* exercise in policy review, is neither well received nor adopted by federal departments and agencies, and does not exist in a formal context outside of the Canadian federal *Cabinet Directive* (see Harriman and Noble 2008; Noble 2003). In a national review of SEA systems and practices, Noble (2009) describes the current state-of-the-art as one of 'promise and dismay', noting that SEA is ongoing in Canada under varied systems and frameworks but with only mixed success.

Third, the assessment of cumulative environmental effects in Canada has been constrained by project-based approaches and has failed to advance to the more regional and strategic tiers of planning and decision-making (Harriman and Noble 2008). The need to consider the cumulative environmental effects of development is outlined in the *Canadian Environmental Assessment Act* and section 16(2) of the Act gives explicit recognition to the use of regional studies as supporting tools for project assessments. Ironically however, regional studies have remained largely divorced from SEA – the very concept developed to address such broader regional and higher-tiered assessment issues, and to facilitate cumulative effects assessment beyond the scope and scale of the individual project (Noble 2008). In those cases where regionally based and cumulative effects assessment initiatives have occurred, they

frequently have not occurred within the context of a strategic framework (Harriman and Noble 2008). As a result, EA beyond the individual project has often lacked a futures-oriented approach, providing limited direction to subsequent regional planning and subsequent project development decision making. In the alternative, it has focused on describing the current state of the environment, rather than also on trends projection, scenario building, and discerning desirable futures (Noble 2008; Duinker and Greig 2006; Quinn et al. 2002). In this regard, Duinker and Greig (2006) describe the current approach to cumulative effects assessment in Canada as doing more harm than good.

Finally, there is an unprecedented need for the integration of sustainability principles in the development of regional PPPs. This integration has yet to be achieved under current models and frameworks of EA in Canada (Gibson 2002). Given the current emphasis on regulatory reform in Canadian EA, both federally and provincially, now is an opportune time to advance the concept of R-SEA as a more integrative model of EA in Canada.

4.2.1 Toward a More Integrative Assessment Framework

Advancing the assessment of cumulative environmental effects in Canada demands a more regional approach than what can be achieved through current project-based EA applications and frameworks. A regional approach allows for a better understanding of the relationships between environment and development, and provides an opportunity for a wider range of roles and stakes to be integrated in the decision making processes (João 2007; Cooper and Sheate 2004; Creasy 2002). This form of EA requires an integrative approach, and one that is operationalized beyond the reach and tier of project-based assessment.

In order to support a more spatially relevant and strategically oriented approach to EA, the Canadian federal government through a federal regulatory improvement initiative, along with various provinces, identified R-SEA as a concept warranting further consideration and development. Based on merging the principles of regional CEA and SEA, the Canadian Council of Ministers of Environment has adopted the following definition of R-SEA:

> *a process designed to systematically assess the potential environmental effects, including cumulative effects, of alternative strategic initiatives, policies, plans, or programs for a particular region* (Noble and Harriman 2008a: 19).

The overall objective of R-SEA is to inform the preparation of a preferred development strategy and environmental management framework for a region. In doing so, R-SEA presents the opportunity to: identify preferred directions, strategies and priorities for the future management and development of a region; improve the management of cumulative environmental effects; and increase the effectiveness and efficiency of project-level environmental impact assessment.

However, scholars and practitioners appear divided on the concept of and approach to a more strategic form of EA (Fischer 2007; Bina 2007). On the one hand, it might be argued that the features of any assessment process above and beyond the individual project are simply those that would also apply to 'good-practice' project-based EA. On the other hand, Clark (2000), for example, suggests that strategic assessments have different features from other types of impact assessment and recognizing this may be a crucial condition for understanding strategic processes and for allowing process and practice improvement. It is argued here that as an integrative and strategic assessment process, R-SEA has different features to other types of regional

environmental studies and impact assessments (Table 4-1), and recognizing this difference is crucial to facilitating its methodological development and application. Regional SEA is set within a different context, asks different types of questions, and thus yields different results. Challenges do remain however, in that notwithstanding a growing national, and emerging international interest in R-SEA, there does not exist a methodological framework to support its further development and to facilitate learning from application.

Table 4-1. Characteristics of regional strategic environmental assessment.

Typical proponent:	Regional planning or administrative authority; public-private partnership; group of industry partners.
Trigger:	Cumulative environmental change or need for regional PPP development or review.
Types of alternatives considered:	Multiple region-based alternatives or scenarios driven by broader regional, sustainability, or policy-oriented goals and objectives.
Scope:	Ambitious and outward-focused, taking into account the combined effects of PPPs, projects, and other disturbances.
Temporal bounds:	Past, present, and longer-term futures of regional environments and economies.
Spatial bounds:	The planning region under consideration as defined by natural features such as watersheds or eco-regions.
Sources and pathways of effects:	Activities of multiple sectors, often diverse and interacting with other regional activities, plans, policies, or developments.
Typical CEA questions:	What are the potential cumulative effects of alternative future scenarios? What are the opportunities and constraints to current and future developments?
Planning orientation:	Contributing to regional environmental conservation, development, or management plans (including sustainable development goals).
Management focus:	Enhance sustainability; avoidance of negative impacts. Select preferred land use alternatives. Focus on risk reduction to regional environment. Regulating future sector activities and development.

*Source: Based on Harriman and Noble (2008)

4.3 Methods for R-SEA Framework Development

In the sections that follow, a framework for R-SEA is introduced, beginning with a discussion of the methodological foundations of R-SEA. The draft R-SEA methodological principles and framework were developed based on a review of:

- existing research and knowledge concerning SEA methodology in the Canadian context (e.g., Noble and Harriman 2009; Harriman and Noble 2008; Noble 2009, 2008; Noble and Christmas 2007; Noble 2005; Noble 2002; Noble and Storey 2001; Bonnell and Storey 2000);
- advances in structured SEA frameworks, guidelines and applications elsewhere (e.g., Partidário 2007a; Jackson and Dickson 2006; Thérivel and Partidário 1996; Thérivel 1993, 2004; Marshall and Fischer 2006; Fischer 2003, 2006; Sheate et al. 2003; European Commission 2001); and
- conceptual frameworks and concepts about regional CEA in Canada (e.g., Harriman and Noble 2008; Dubé et al. 2006; Kilgour et al 2007; Duinker and Greig 2006; Greig et al. 2004; Dubé 2003; Kennedy 2002; Munkittrick et al. 2000; Beanlands and Duinker 1983).

Literature and framework reviews were supplemented by interviews with international SEA and CEA academics and practitioners and Canadian EA government administrators. International academic and professional practice literature was used to identify potential interview participants. Administrators were identified through membership in the Canadian Council of Ministers of the Environmental Assessment Task group. A 'snowball' sampling technique was also used during interviews to identify additional potential participants. A total of 41 individuals were contacted, 30 of whom granted an interview. Participants included internationally recognized SEA and EA academic experts; practitioners involved the development and

application of regional, strategic planning and assessment frameworks in Canada; and Canadian EA administrators representing jurisdictions interested in the development of R-SEA.

Interviews ranged from 35 to 120 minutes in length but typically lasted about an hour. Participants were asked a series of semi-structured questions exploring various aspects of SEA, CEA, regional approaches, and their integration including, questions on: (i) existing R-SEA-type frameworks and lessons in application; (ii) core methodological principles and conceptual and methodological issues that accompany blended SEA-CEA regional frameworks; and (iii) motivations, expectations, drivers, and key success factors for R-SEA in Canada and internationally. Interview results were coded using NVivo software for qualitative analysis.

The draft principles and framework were then circulated for peer review with the assistance of the Canadian Council of Ministers of Environment Environmental Assessment Task Group. Three Canadian SEA-CEA experts and two international experts reviewed the draft principles and framework as well as the Environmental Task Group federal and provincial members and representatives of three federal government agencies. Expert reviewers were asked to evaluate and comment on: i) the proposed principles and foundations of R-SEA; ii) the overall methodological framework and component parts; and iii) critical elements either included in or missing from the framework that could contribute to improvements in the current environmental assessment process in Canada. Responses were analyzed in a similar fashion to the analysis of interview text, and common themes and suggestions identified and integrated into the draft principles and framework.

4.4 Methodological Foundations of R-SEA

The intent of R-SEA methodology is to support a more spatially relevant and strategically oriented approach to EA – one that provides an early, overall analysis of the relationships between alternative futures for a region and the potential cumulative environmental effects that may emerge under multi-sector land uses and surface disturbances associated with different future scenarios. This requires a methodological approach that is founded on the integration of current knowledge, experience, and theory drawn from strategic, cumulative, and regional environmental assessment – each of which is characterized by a number of core principles that together form the core methodological principles of R-SEA. Based on international SEA and CEA academic literature and applied assessment frameworks, and drawing upon the results of participant interviews, R-SEA methodology must reflect the core principles of a 'strategic-based', 'cumulative effects-driven', and 'regionally focused' approach (Table 4-2). These core principles inform the operational components of R-SEA and characterize its underlying approach to impact assessment and decision-making.

4.4.1 Strategic

First, R-SEA methodology must adopt the underlying principles of a strategic approach (see Cherp et al. 2007; Noble 2000). A strategic approach to impact assessment is usually defined in terms of tier of application (Partidário 2000), and also by the relationship between impact assessment and the broader planning process and the types of questions being asked (Bina 2007). A strategic assessment is one that ensures the full consideration of alternative options at an early stage when there is greater flexibility with respect to decision-making; it is one that asks "what is the preferred option?" and "what are the possible futures?" rather than predicting the most likely

outcomes of a predetermined action. Thus, R-SEA is concerned with problems and situations in which decision makers must evaluate and assess competing and often conflicting futures on the basis of multiple criteria, cumulative effects or broader sustainability objectives.

R-SEA methodology then is not developed based on the need to make detailed impact predictions about environmental stressors, important though this is, but to identify and assess the opportunities, risks, and threats of opting for a particular future or development scenario, taking possible outcomes of plans and policies to be highly probable, in order to assess their potential positive and negative impacts and to propose measures to avoid or minimize potential cumulative impacts and interactions (Partidário 2007). Preferred strategies or PPPs must be treated as experiments with an expectation that they will be adapted over time as monitoring progresses and new knowledge is gained or as goals and priorities change.

Table 4-2. Core methodological principles for R-SEA.

Strategic	
Futures-oriented	▪ Focuses on identifying possible futures and the means to shape sustainable regional outcomes. ▪ Approaches cumulative environmental effects as effects that speak about the future, and includes the total effects of past actions. ▪ Focuses not only on what has happened in the past, but also on potential future trends, which may include also a number of surprises.
Alternatives-based	▪ Identifies and systematically compares the environmental effects of alternative development scenarios to obtain a vivid picture of the likely consequences of different initiatives, management plans, or courses of action. ▪ Identifies strategic initiatives and formulates a strategy for moving forward.
Integrative	▪ Undertaken at the earliest possible stages of decision making so as to inform the development of strategic initiatives and PPPs before irreversible decisions or actions are taken. ▪ An integral part of, and provides overall guidance to, the development of regional strategies and initiatives rather than serving as a framework against which already developed PPPs are measured and assessed.
Adaptive	▪ Focuses on possibilities rather than predictions, and accepts uncertainty when dealing with distant future conditions. ▪ Treats strategies and PPPs as experiments, expecting to modify and adapt

	them as new knowledge is gained through implementation, monitoring, and feedback.
Cumulative Effects Driven	
VEC-centered	▪ Valued ecosystem components are the central focus of the impact assessment. ▪ Attention is given to broad-scale, regionally-relevant VECs such as 'ecosystem integrity,' 'biodiversity,' 'habitat connectivity,' etc., in addition to traditional project EIA-type VECs. ▪ Emphasis is placed on examining the full range of stresses on those regionally-relevant VECs.
Effects-based	▪ Bottom up approach that focuses on evaluating cumulative effects upon certain VECs as an indicator of the existing state of the (regional) environment.
Multi-scaled	▪ Takes into account perturbations and processes operating at multiple spatial scales within and outside the region. ▪ Attention is given to local process of change as well as multi-regional, national, and global scales of change.
Regionally Focused	
Ecosystem-based	▪ Scale of application is defined by ecological rather than political or administrative boundaries. ▪ Attention is given to protecting, supporting, or enhancing existing ecosystem services. ▪ Attention is paid to important ecosystem relationships and pathways and processes of change.
Multi-sector	▪ Encompasses, in the broadest sense possible, the activities, policies, and plans of multiple sectors that may exist in a region or that may influence regional processes of change and decision-making.
Multi-tiered	▪ The assessment informs, and is informed by other existing or proposed policies, plans, programmes, and projects within the region, or with influence upon the region. ▪ In particular, R-SEA should be deliberately tiered toward downstream decision making and project EA, with intent to potentially streamline or enhance these processes.
Opportunistic	▪ Embraces the opportunity to examine regional development through broader stakeholder debate. ▪ Identifies the need to create or modify institutional arrangements for improved environmental management.

*Source: Based on Thérivel and Ross (2007); Noble and Christmas (2007); Theobald 2007; Vicente and Partidário (2006); Noble (2006); Seabrook et al. (2006); Duinker and Greig (2006); Dubé (2003); Noble and Storey (2001); Duinker (1994); and interview data from the present study.

4.4.2 Cumulative Effects Driven

Second, the assessment of cumulative environmental effects must not be an 'add-on' component to impact assessment as is frequently the approach in project-based EA (see Duinker and Greig 2006); rather, R-SEA is to be cumulative effects-driven with the assessment of cumulative

environmental effects implicit to the entire impact assessment and strategic decision-support process. This requires that valued ecosystem components (VECs), those components of the natural and human environment that are of primary scientific, ecological, or human value and thus the focus of assessment (see Beanlands and Duinker 1983) are front-and-centre in R-SEA.

Cumulative effects processes are often highly complex, multi-scaled, and linked with broader regional and global environmental management concerns. The choice of VECs must be relevant to the strategic tier and spatial scale of R-SEA, and VECs must be represented by broader indicators of regional environmental change or ecosystem sustainability such as 'biodiversity', while at the same time capturing the relevant and more 'traditional' species or issue-specific VECs that function at different spatial scales and are often the focus of project-based EA (Thérivel and Ross 2007). Given the increased complexity of cumulative effects beyond the individual project, it is rarely possible to identify and understand individual stressors. An effects-based approach is required where attention is focused on evaluating the total environmental effects on the sustainability of individual VECs and on the broader regional environment irrespective of the individual stressors (see Duinker and Greig 2006; Dubé 2003; Duinker 1994) such that the implications of alternative futures can be understood and the opportunities and risks assessed.

4.4.3 Regionally Focused

Finally, R-SEA is inherently regional in scope and, as such, R-SEA methodology must also reflect this regional context. Regional approaches are intended to enable more effective and systematic assessments of environmental effects, particularly cumulative effects (Duinker and Greig 2006; Grzybowski & Associates 2001; Davey et al. 2002). Regional assessment accounts

for as many development sectors and stakeholder groups as possible, recognizing competing interests and values, and the potential for alternative future visions for development in a region.

The regional context provides a unique opportunity to identify and address meta-issues which would otherwise be missed through case-by-case project-level assessment (Cooper and Sheate 2004). Core to R-SEA is an ecosystem perspective – adopting regional units defined by ecological relationships, such as watersheds, rather than political or administrative ones. This scale of assessment is thought, for example, to better capture VEC interactions; facilitate pathways analysis (air, land, water, etc.); reflect the multitude of interests at stake; and facilitate regional understandings and considerations of cumulative environmental change (Noble 2005; Dalal-Clayton and Sadler 2005; Cooper and Sheate 2004; Dubé 2003; Kennett 2002; Bonnell and Storey 2000; Canter 1999).

Scale of analysis is also an important consideration in R-SEA; particularly knowing when to focus the assessment broadly and when to 'zoom in' for detailed investigation. R-SEA should be designed within the context of multiple tiers – informed by higher tiers of PPPs that already exist or may be planned for a region and explicitly relevant to lower tier assessments and project developments. Finally, R-SEA, as a regionally-focused approach, can capitalize on the strengths in a region including the knowledge of its people, institutions, organizations and networks, as well as any existing data and knowledge gained through project-based impact assessment and monitoring programs recognizing that supportive institutional arrangements and/or regulations may be needed.

4.5 Methodological Framework for R-SEA

As an *impact assessment* process, R-SEA adopts such ex-ante tasks as scoping; identification and evaluation of alternatives; identification of a preferred option; mitigation; reporting; and monitoring, all in a consistent and systematic form, ensuring open and accountable decision making, and contributing to the improved quality of subsequent decisions (see Noble and Christmas 2007; Fischer 2007; Noble and Storey 2001; Partidário 2000). The proposed R-SEA framework adopts a standard SEA framework and its typical phases (after Noble and Storey 2001). The output of an SEA framework and of the proposed R-SEA framework does not present 'the decision' but rather the results of a systematic evaluation of options such that a strategic direction can be identified for the region of concern and informed PPP decisions can be made.

As with any strategic approach to EA (see Verheem and Tonk 2000), specific design for specific application will increase the effectiveness of R-SEA. As such, the framework presented here is not meant to be overly prescriptive. Depending on the nature of the issue at hand a more or less onerous application of the framework will be desired. In an operational sense, this demands a structured framework within which a liberal variety of methods and techniques can be used to address particular questions at the regional and strategic levels of decision-making.

The proposed R-SEA methodological framework is presented in Figure 4-1, and consists of three interrelated components:

i) a pre-assessment phase, focused on developing a reference framework for the assessment, scoping the environmental baseline, identifying cumulative baseline change, and delineating key trends and cumulative effects stressors of concern;

ii) an impact assessment phase, often technical in nature, that serves to identify and assess the cumulative environmental effects and associated impacts of alternative options and leads to identification and selection of a preferred option; and,

iii) a post-assessment phase, focused on moving R-SEA output forward to PPP implementation and following-up on the results.

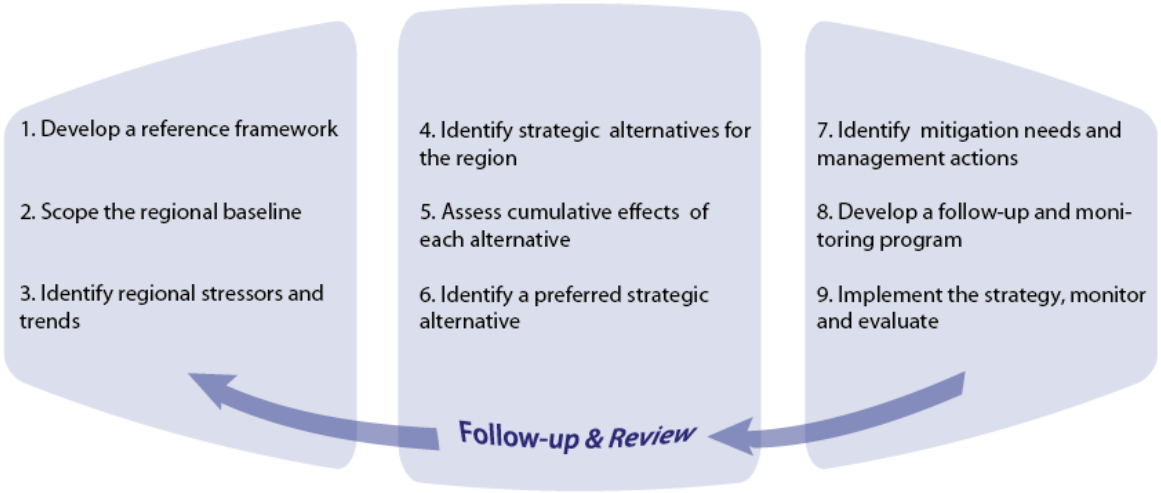

Figure 4-1. R-SEA framework.

The usual steps in an SEA process are organized into three phases to emphasize the importance of both a well planned process (pre-assessment phase) and a well designed and executed implementation and monitoring plan (post-assessment phase). The proposed R-SEA framework is a standard one as described above but the interpretation of each step in the framework is unique to the regional, strategic context and reflects the research results.

4.5.1 Develop a Reference Framework

Like any EA process, the initial step in R-SEA is to develop a reference framework and establish the context within which the R-SEA will take place. There is a relation between the awareness of

context, context sensitivity, and the success of R-SEA implementation (see: Runharr and Driessen 2007; Hildén et al. 2004; Marsden 1998). Context refers to the facts or circumstances that have an impact on R-SEA and also the conditions that have an impact on the outcomes of R-SEA implementation. This includes the chosen aims or goals of R-SEA, the institutional or regulatory environment, expectations about the process and its implementation, the participants in the assessment process, and the organizations involved (Hilding-Rydevik and Bjarnadóttir 2007; Hedo and Bina 1999). In particular, Canadian and international experts emphasize that good assessment "utterly depends" on public engagement. With this in mind, the objectives in developing a reference framework are to delineate the overall nature and scope of the R-SEA, including:

- The specific question(s) or strategic problems in the region to be addressed and any specific expectations for the assessment.
- The time frame to carry out the R-SEA process in light of key decision windows.
- Opportunities for tiering to project impact assessment and to other forms and scales of planning and decision-making.
- The various parties and partnerships to be involved in the process and, at least initially, in monitoring and following-up on implementation.
- The likely relevant publics and desired or appropriate extent of involvement and consultation.
- Developing terms of reference for the assessment.

Academic experts emphasized that early consideration should also be given to the availability of existing science, how that science is to be organized and used within the R-SEA process, and to how much new science must be carried out in order to support and successfully implement the R-

SEA. Such considerations are important in framing the overall R-SEA process, and in determining the overall scope and level of commitment required to carry out the R-SEA.

4.5.2 Scope the Regional Baseline

Scoping in any EA serves to identify the key issues of concern, including VECs, and their key indicators (Noble 2006). At the heart of scoping is a series of decisions to either 'scope in' or 'scope out' issues and components (Mulvihill and Baker 2001). This is necessary to provide boundaries for the assessment and to carry out R-SEA within the constraints of time and resources, and also to ensure that the process is able to deliver results in a timely fashion to support decision-making (Wright 2007).

Because decisions about what is included or excluded are largely subjective in nature, such decisions must be justified and made explicit. An R-SEA cannot include consideration for every element or issue in a region. It is thus important to focus the assessment on VECs and issues that are important as scientific regional indicators and as indicators of public concern. For R-SEA, government administrators suggest utilizing a mix of traditional VECs, as well regionally-relevant VECs (Table 4-3).

Table 4-3. Traditional VECs vs. regionally-relevant VECs.

Traditional VECs (e.g. Project EA)	**Regionally-relevant VECs (e.g R-SEA)**
Individual organisms, populations or communities	Species guilds; biodiversity; ecosystem services (e.g. provisioning, regulating, etc.)
Protected or heritage sites	Environmentally sensitive areas; rare BGC zones
Riparian zones; ambient noise levels	Overall quality (and quantity) of topsoil, groundwater supply, air-shed
Wildlife site (e.g. feeding ground)	Habitat connectedness; movement corridors

Through scoping is it possible to establish an environmental baseline for the region, or a 'snapshot of current conditions' that can be: i) monitored over space and time for the purposes of change assessment, and ii) projected forward, either quantitatively or qualitatively, and used as the future conditions against which alternative options and future scenarios can be assessed for the region (Noble 2006). Scoping in R-SEA entails several stages, namely:

- Identifying key regional issues and concerns, particularly those that are cumulative in nature.
- Determining appropriate spatial and temporal boundaries for the assessment, and appropriate resolution of data.
- Establishing VECs and their key indicators which will become key to the assessment of regional impacts.
- Evaluating the current state of VECs.

Scoping follows similar procedures to any assessment with the additional principle that issues, VECs, and VEC indicators are interpreted in a regional context and include explicit attention to cumulative environmental effects.

4.5.3. Identify Regional Stressors and Trends

This is the retrospective phase of R-SEA, in which attention is given to identifying the forces and patterns of change in a region and how they influence VEC conditions. In project EA and in SEA for some programmes and low-level plans, this typically involves regression analysis to identify trends for the purpose of predicting future conditions. While this may still be applicable in R-SEA, academic experts emphasized that the focus shifts somewhat away from quantification and prediction—due to inherent uncertainty around future regional conditions—and toward

understanding broad drivers of regional change and their likely influence on the environment. One academic, with years of practical SEA experience, explains it in the following way:

> Given any amount of development in the future, what kind of strategies would we need to put in place so that it's all sustainable? For example, take a goal like water neutral development. If you require that all developments get water from rainwater collection or recycling of groundwater, if you put those kinds of measures in place, that is like perfect cumulative impact assessment and mitigation. If you put those kinds of plans in place you can say, fine, it doesn't matter what kind of development, we can have complete uncertainty as long as we have certainty that any development follows these rules.

The above quote indirectly suggests that choices around preferred forms of development and technology have bearing on regional environmental futures. Regional landscape change is often the result of interaction among factors such as: population; economics (industry); cultural values; policy; and science/technology (Seabrook et al. 2006). Some specific drivers of regional change may include the expansion or contraction of industrial sectors (energy, forestry, mining, fishing, etc.); in- or out-migration of population and other population shifts; land change processes such as clearing for agriculture, conversion to suburban land or natural processes of change such as desertification; disease or infestation. Thus in R-SEA this phase includes:

- Identifying the primary natural and human drivers of change or patterns of disturbance in the region, including changes in policy directions and management approaches, with attention to cumulative pathways of change and potential positive and negative feedback loops.
- Characterizing VEC or VEC indicator responses over space and time, identifying, when

appropriate and possible, thresholds, management targets, and maximum limits of change for VECs. This may include discussion around concepts such as carrying capacity; statements of community values; and sustainability objectives.

In many cases, cause-effect relationships between past disturbances and VEC responses may not be known, and correlation or qualitative associations may be relied upon. Constructing such relationships can be time and resource intensive, depending on the scope and scale of the assessment, but it is an important foundation to understanding and evaluating possible future conditions and alternative scenarios of cumulative change in the region.

4.5.4 Identify Strategic Alternatives for the Region

Recent studies suggest that alternatives assessment is at the heart of SEA and that scenario analysis is useful to help identify and systematically assess a range of alternative options for the regional strategy or PPP being developed (e.g. Desmond 2007; Duinker and Greig 2007; Noble 2006; Noble and Storey 2001). Interview data suggests that this is also true for R-SEA: several interviewees emphasized that the consideration of alternatives to development is a fundamental feature of "good planning." For example, one academic interviewee noted that whether you are doing SEA or land use planning "…if you're actually doing proper planning, you will look at alternatives and have a whole public consultation process, and look at mitigation and all of those good things." Included amongst the alternatives is the future baseline scenario, or the alternative of continuing with the status quo, against which other alternatives and scenarios can be compared (Noble 2006). In addition, government administrators and practitioners suggested there is value in considering alternatives that are widely divergent from the baseline scenario in

order to illustrate a wide range of possible regional futures. Procedurally, identifying alternatives involves:

- Identifying strategic alternatives or ways to proceed in the region, including the baseline alternative.
- Constructing scenarios of what each alternative will consist of in the regional environment, accounting for the influence of external policies, actions, or natural change.

By constructing and comparing multiple, alternative scenarios, decision-makers are able to obtain a vivid picture of the potential consequences and cumulative effects of different trajectories of human development. In so doing, the focus of R-SEA is again shifted away from trying to predict effects and toward understanding what conditions are most likely to unfold under different, proposed circumstances. As one academic interviewee explains: "The real irony of impact assessment is that the things you can predict with precision are normally not the things that are the real issues anyway." This phase of the assessment is not about *predicting* the future; rather, it is about creating a *choice of futures* by determining alternative possibilities and thereby creating a foundation for strategic planning and shaping subsequent actions.

4.5.5. Assess Cumulative Effects for Each Alternative

Assessment is carried out in order to estimate the nature or quality of the potential effects of future scenarios as constructed under each of the alternatives. While the ultimate goal is to ascertain the desirability of each future scenario, the focus at this stage is on characterizing the effects that could result under each scenario including the future baseline scenario (Noble 2006; Thérivel 2004). The objective of assessment in R-SEA is to identify potential cumulative effects

on, threats to or changes in the state of VECs under each alternative scenario (Noble and Harriman 2008a).

Interviewees indicated that there are a number of different ways to assess the potential cumulative effects associated with each alternative development scenario. These include:

- 'Summing up' individual effects such that a range of individual effects on VECs are evaluated and summarized into trend information.
- Focusing on regional environmental issues identified for the region and whether they will grow worse or better, or undergo qualitative change under each alternative scenario.
- Assessing the effects on VECs of broad regional change agents such as surface disturbance that are, by definition, cumulative and provide a measure of ecosystem health.

In any case, the processes described typically included a combination of technical or analytical methods and techniques, and stakeholder-based participatory exercises in which interests and positions are explored and there is opportunity for in-depth discussion and debate about potential effects. The approach taken and the particular tools employed will depend upon: the goals and objectives of the assessment, available time and resources, the type and quality of data available for the region, the complexity of the cumulative effects issues under consideration and so on (see Figure 4-2).

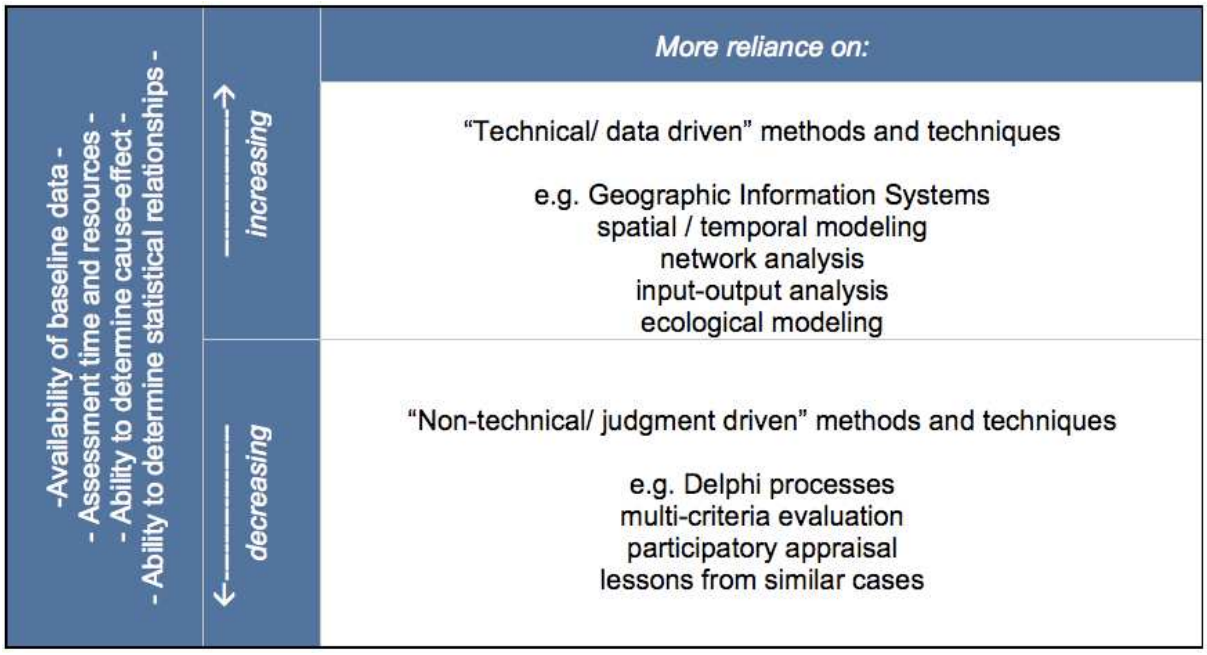

Figure 4-2. Selecting methods and techniques in support of R-SEA.
Source: Based on Noble and Harriman 2008b.

When uncertainty is high, some interviewees reported relying on directional impact statements (improving worsening, etc.) and ordinal scales of impact assessment (large, medium, small, unknown impact). Often, simple +/− projections are all that is possible in impact assessment. In other cases, where sufficient baseline data are available, other interviewees suggested that quantitative methods and tools capable of processing vast spatial data sets and considering complex pathways and interactions (e.g. simulation modeling) may provide the most utility.

4.5.6. Identify a Preferred Strategic Alternative

Once the likely environmental effects of each alternative scenario have been established, the next phase is to make judgments about the nature and significance of their impacts to help determine the relative desirability of each scenario (Fischer 2007; Patidario and Thérivel 1996). To identify

a preferred alternative or alternatives in R-SEA is to make a strategic choice about the desirability and acceptability of that development path. This phase would ideally involve a wide range of stakeholders systematically evaluating and comparing each scenario, including the baseline scenario, based on a number of agreed upon decision criteria which may or may not include:

- Implications for the sustainability of the affected VECs and the regional environment.
- Potential to exacerbate, improve or forge new regional cumulative impacts or impact pathways.
- Distributional consequences of change under the scenario with regard to social, economic, and cultural effects, including inter-generational equity.
- Judgments about maximum net gains anticipated under each scenario.
- Consistency and compatibility with broader policy or sustainability initiatives including public preferences and priorities.

A variety of existing tools and techniques are available for comparing the outcomes under each alternative scenario, and for selecting a preferred option including matrices, out-ranking, goal programming, and multi-criteria evaluation, as well as more participatory approaches such as public surveys, forums, and focus groups (see Aura 2009).

It is important to note that more than one strategic alternative may be determined as desirable at this phase. Several Canadian interviewees emphasize that selecting a preferred alternative or best practicable environmental option (Bond and Brooks 1997) is an iterative process and may require re-assessing alternatives based on considerations of mitigation and management needs.

Traditionally, impact significance had been determined by considering: magnitude; likelihood; duration; frequency; sensitivity; and/or recoverability/reversibility (Noble 2006; Jones et al. 2005). However, considering the complex nature of cumulative effects processes and their prominent role in R-SEA, several interviewees suggested it may not be possible to evaluate significance in the same way as is typically done in a project-style assessment. For example, one SEA practitioner explained that:

> …we adopted a number of fairly standard criteria that are used to assist in determining impact significance, for example, aerial extent, frequency, and duration…but that's where this whole issue of uncertainty came into play…under the potential for significant effect we found we had a couple of options: we could say yes, there is potential, no, the potential is limited, or it is uncertain; the database is too limited to support a judgment.

In other words, the approach to determining impact significance in R-SEA may have to be adapted or altered to suit the context.

4.5.7. Identify Mitigation Needs and Management Actions

At this stage, a preferred alternative has been identified. It is accepted that some range of impacts will occur. The goal is now to make plans to mitigate or compensate for unavoidable impacts associated with the chosen alternative to enhance its degree of acceptability or desirability. Even a preferred alternative may result in some potentially adverse effects that need to be mitigated (Noble 2006). As such, the need for and types of mitigation should be identified and prescribed and any residual effects identified. This may include, for example, designating 'exclusion zones' for highly sensitive regions where no further development is to occur (see for example: GSH

SAC 2007) or identifying best management practices to minimize further impacts of change in those areas where development may already exist.

Government administrators believed that in R-SEA, mitigation plans should not only reflect the overall goals and objectives assessment but could ideally build on initiatives already in motion as a result of other regional plans. In general, interviewees posited that mitigation plans should strive to improve the state of regional cumulative impact issues; be relevant to the life-cycle or term of the PPP; and be regionally-based, relying on inter-agency efforts. In some assessments, alternative development scenarios may be designed to be inclusive of mitigation and management actions (Jones et al. 2005). However, government administrators argued strongly that it is important to consider the merits and demerits of each alternative scenario independent of any proposed mitigation and management action that may or may not be implemented. The reasoning for this is there is no guarantee that the planned mitigation or management actions will take place.

With those considerations in mind, the final choice of a preferred alternative demands explicit consideration of:

- Mitigation requirements and residual effects of the preferred alternative scenario(s).
- Management actions and resources required for implementation or environmental safeguarding.

Several interviewees emphasized that attention must also be given to management actions, including the resources and institutional arrangements necessary to support the preferred option. There is a particular need to (re)consider strategic alternatives in light of how each may or may not fit within or contribute to existing regional environmental policy and management initiatives. One government administrator summed it up neatly: “The only (question) that pops into my

head, about the whole concept of regional strategic environmental assessment is: 'How does this tie into the processes that are already in place?'" Thus, consideration should be given to the feasibility of implementation and whether a supportive institutional environment exists for the preferred alternative. For example, new management frameworks or implementing agencies may need to be established, or current land use or other conflicts in the region may need to be addressed in order to make the preferred alternative a feasible one.

4.5.8. Develop a Follow-up and Monitoring Program

Recent research (Noble 2008; Fischer 2007; Partidário and Fischer 2004) suggests that a follow-up and monitoring program in SEA should include reference to the variety of activities that take place after the endorsement of a preferred regional strategic alternative, including:

- Plans for post-decision monitoring of VECs and/or associated indicators.
- Plans for performance evaluation of the preferred alternative which may include reference to established ecosystem thresholds, targets, and/or maximum effects levels, and/or triggers for corrective actions.
- Plans for performance evaluation of any policy or other performance goals or objectives that may have been identified in the assessment.
- Plans for performance evaluation of the R-SEA process itself, and triggers for re-assessment.
- Plans for reporting on monitoring results and the strategy's performance to the public.

Follow-up in a strategic context is critical because strategic alternatives are often based on long-range development scenarios formulated under considerable uncertainties. Moreover such alternatives are potentially large in the scope of their impacts and may be quite sensitive to

changes in broader social and economic conditions (Noble 2008). A good follow-up program in R-SEA is focused on ensuring that (Noble and Harriman 2008a):

- The R-SEA process delivers its intended results and the selected strategic alternative is leading to the desired types of changes anticipated for the region, including abatement of any undesirable forms of cumulative environmental change.
- Impact mitigation and management measures are effective.
- There is appropriate adaptation to any emergent and external factors that may impede success including, if necessary, amending or adapting the follow-up plan.
- There are triggers in place that indicate the need to reconsider the chosen development alternative.

The plan for follow-up and monitoring is the only tangible link to the strategic alternative and the mitigation of its anticipated impacts. One international academic indicated that SEA is sometimes applied as a discrete intervention or evaluative tool for existing PPPs. However, Canadian administrators and practitioners generally envisioned R-SEA as an on-going or 'living' process that should be periodically evaluated or revisited in order to make necessary course corrections.

4.5.9 Implement the Preferred Strategic Alternative and Monitor

In this stage, the desired alternative for the region and its related plans for mitigation and monitoring are finalized and put into action. This consists of:

- Undertaking a formal public review process of the proposed strategy, including plans for mitigation and management (bearing in mind that appropriate levels and types of public consultation were ideally integrated throughout the assessment process).
- Finalizing roles and responsibilities to support implementation of the alternative, perform monitoring, and provide feedback and review.

Verheem (2002) suggests public review of and feedback on the desired alternative is an iterative process and provisions must be made in the timeline of implementation to allow for public response and any further modifications to the alternative that may be required. In cases where the same authority is responsible to both carry out the R-SEA and implement the preferred strategic alternative, an additional review by external experts is particularly desirable (Noble 2008). Following public and/ or expert review, a summary of responses alongside any modifications to the strategic alternative should be made available to the public so as to ensure openness and accountability. This demonstrates that the views of the affected publics are taken seriously and integrated, where possible, in the final design of the strategic alternative. One practitioner with many years of experience in EA explains the importance of public engagement as follows:

> I think it is safe to say that good assessment depends utterly on public engagement, because the people who are likely to show up and participate in these exercises are the ones who probably have the most effective, driving motivation to impose a good critical eye on work that would otherwise be shoddy. Governments typically are just trying to get the work done and the projects out the door. There are cases where government reviewers are spectacularly brilliant, thorough, and dogged, but it's not the common practice, and so where we have had really good work done, it's often

> because it is driven by citizens or the fear that citizens will be looking over their shoulder.
>
> That means that it's very crucial to have effective citizen engagement in SEA, as much as in project level assessments, but it's harder. Because frankly, stuff is more abstract. Initiatives like policies and programmes are much less directly threatening and consequently much less likely to drive people to get engaged. So it's a significant question for the quality of SEA and how you achieve that. If the citizens don't get to see what the government is doing, they don't have a basis for an evaluation, and so we have to think carefully about how to maximize the prospects for good citizen engagement (in SEA).

Opportunities for citizen engagement were determined at the outset of the process; however, interviewees with experience in applying R-SEA-like processes point out that organizations and agencies responsible to carry out the R-SEA process are not necessarily those that will need to be involved in implementation. Implementation of a strategic initiative will likely require a level of cooperation and commitment that extends well beyond the resources, capacity, and authority of the organization(s) or agency(ies) initially involved.

4.6 Conclusion

R-SEA in Canada is still in its early stages of development and remains largely untested. That said, the R-SEA framework proposed herein is constructed from the best available knowledge and experience of Canadian and international experts, practitioners, and administrators with regard to SEA, regional scale assessment, and CEA. It has also been peer-reviewed by Canadian and international EA experts. The R-SEA framework has several unique characteristics based on

the research results that set it apart from any previous formal attempt to define regional SEA, including that it:

- Encourages deliberate tiering toward project EA.
- Encourages explicit linkages to horizontal and higher tiers of planning and assessment.
- Focuses attention on regionally relevant VECs and indicators.
- Focuses attention on regional cumulative effects issues and regional drivers of change.
- Adopts a futures-perspective, emphasizing alternative development scenarios and the means of moving forward to achieve the desired alternative.
- Integrates cumulative effects considerations on a consistent and persistent basis.
- Maintains flexibility with respect to methods and techniques.
- Emphasizes feedback and learning both within the R-SEA process and post-implementation through carefully designed follow-up.

Following from the literature, the anticipated substantive benefits of applying the R-SEA framework are that it may: facilitate the development of improved regional PPPs and strategic initiatives by ensuring appropriate attention to environmental concerns; provide a broader, regional vision for development that helps to guide subsequent decision-making and project development; ensure that cumulative environmental effects and issues are captured and addressed at the appropriate tier and scale; and, contribute to regional sustainability goals and objectives. Procedurally, the R-SEA framework is designed to: enable and encourage data sharing and transparency; facilitate state-of-the-region environmental monitoring and reporting; save time and resources by providing a means to streamline subsequent project EA; set some

goals, objectives, targets, and limits against which to conduct project-based performance assessment; and, capture early indications of public interests and issues in regional development (for further elaboration of potential benefits, see for example: Noble and Harriman 2008b; Gryzbowski & Associates 2001; Fischer 1999).

In order for R-SEA to realize its potential, however, and add value to the current range of environmental assessment, planning, and management activities that currently exist in any region, the research suggests a number of challenges will need to be overcome, perhaps the most obvious of which is the need to align institutional arrangements and construct a supportive regulatory framework. At present, R-SEA does not have a 'home-base' among the many federal and provincial Canadian institutions responsible for environmental management; the process has no specific triggers; and any of its results would not be binding upon the assessed region. There are also several conceptual and methodological challenges specific to the integration of SEA and CEA that must be given further attention including the need to more clearly define the relationship of R-SEA to regional planning and management (Fischer and Seaton 2002).

At present, there is an articulated desire to pursue the application of R-SEA frameworks in Canada and provinces such as Saskatchewan and Alberta have already taken steps to implement similar frameworks (GSH SAC 2007; Johnson et al. 2008). Moving forward, the present study indicates it is critical to remember that addressing regional cumulative effects issues in a strategic manner requires more than simply expanding the assessment boundaries to encompass a broader geographic area; it represents a different way of approaching the interrelationships between environment and development. It is hoped that R-SEA in the future in Canada will reflect a truly 'strategic' mind-set, leading to results and strategic alternatives for development that are not possible to capture within the confines of project EA.

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CHAPTER 5

Integrating Cumulative Effects Assessment and Strategic Environmental Assessment: Conceptual and Methodological Challenges

5.1 Introduction

Of all the challenges of environmental assessment (EA), one of the most enduring has been that of addressing cumulative environmental effects. Although consideration of cumulative effects has been mandatory for all project-based EAs under the *Canadian Environmental Assessment Act* since 1995, cumulative effects assessment (CEA) remains something of an enigma in Canada. Despite best efforts, CEA in Canada and abroad has been observed as "inadequately distinguished from (project-based) EA" (Baxter et al. 2001: 253; Cooper and Canter 1997) and lacking in methodological guidance (Duinker and Greig 2006; Piper 2001). Similarly there is ongoing confusion around what exactly CEA should involve (Thérivel and Ross 2007; Noble 2006; Ross 1998; Burris and Canter 1997; Kennedy 1994). This uncertainty is only exacerbated in the realm of strategic environmental assessment (SEA), where attempts at CEA also suffer from a general lack of guidance, understanding, and structure. At the Canadian federal level, for example, SEA retains the status of a Cabinet Directive; and at the provincial level there are no formal requirements for the SEA of policies, plans, and programs. In the province of Saskatchewan, EA legislation can be interpreted to support the assessment of policies, plans, and programs, but there are no explicit requirements or triggers for SEA. Understandably, progress in

strategic level CEA or CEA beyond the project scale in general has not only been slow to evolve but also difficult to track as many SEAs are carried out on an informal or ad hoc basis.

This general lack of guidance on CEA is further complicated in that SEA itself suffers from a certain crisis of identity with respect to concepts and methods (Fischer 2007; Finnveden et al. 2003; Stinchcombe and Gibson 2001; Noble 2002; Thérivel and Partidário 1996). Despite that certain aspects of SEA concept and methodology are still evolving (Jones et al. 2005), there is a strong collective agreement that cumulative effects (CEs) are best addressed in a strategic context (e.g., Dubé 2003; Noble 2005; Sadler and Verheem 1996; Wood and Déjeddour 1992), and particularly so in regional applications of SEA (Noble 2008; Bonnell and Storey 2000; World Bank 1996). In practice however, little seems to have changed since Thérivel and Partidário's (1996: 17) observation that "…evidence for how this synergism is achieved has yet to be demonstrated with adequate methodologies and empirical examples." There has been very little dialogue or investigation on whether SEA and CEA as concepts are well suited to one another or whether there is much more to consider in the process of integrating cumulative effects considerations into SEA. Practitioners of SEA still tend to borrow heavily from project-based EA, both conceptually and methodologically, when dealing with cumulative effects.

Despite an apparent assumption that CEA in a strategic setting is simply 'the same as' CEA in a project-based EA setting, it is argued here that the two types of assessment do not blend seamlessly or effortlessly. Several features of SEA complicate the consideration of cumulative effects and cumulative effects pathways. At the same time, CEA—as it has been conceived and applied for the purpose of project-based EA—may not fit well conceptually or methodologically with SEA processes and principles.

This paper investigates a number of conceptual and methodological challenges that emerge when attempting to blend SEA and CEA, drawing on the experience of leading international academic experts and practitioners. The sections that follow begin with a brief review of the central arguments in support of the integration of SEA and CEA, particularly in a regional setting. This is followed by discussion of a range of conceptual and methodological challenges that accompany SEA-CEA integration. The paper concludes with a discussion of the implications of the identified challenges for advancing SEA-CEA integration.

5.2 Support for SEA-CEA Integration

The integration of SEA and CEA is currently an important topic both internationally and in Canada. In 2008 for example, the International Association for Impact Assessment held an international conference and workshop dedicated specifically to CEA where the integration of SEA-CEA frameworks and practices was central to discussion. In the Canadian context, several provincial jurisdictions (including Saskatchewan, Alberta, and Nova Scotia), the Canadian Council of Ministers of the Environment, and the Canadian Environmental Assessment Agency are working together to develop a framework for regional applications of SEA that support CEA integration. The challenge is that most of the literature in support of SEA-CEA integration is very general in nature, and when it is more specific it tends to focus disproportionately on topics such as the perceived need to fuse SEA and CEA and the anticipated benefits of integration. Rarely does it go further to consider the specific challenges of integrating SEA and CEA, or how CEA might reach its full potential in SEA, considering it has not done so in project-based EA. The answers to these issues begin with an understanding of some of the challenges that CEA has typically faced in a project-based EA setting.

5.2.1 The Challenge of CEA in Project-Based Environmental Assessment

Cumulative effects assessment, generally defined as the practice of systematically analyzing cumulative environmental change (Sears and Yu, 1994; Spaling, 1994; Smit and Spaling, 1995), is a required component of the federal EIA process in Canada, the United States, the United Kingdom, and in many other countries around the world (Noble 2006). However, despite that scientific, regulatory, and assessment communities ecognize the importance of CEA to environmental decision making, current assessment and management approaches fail to adequately predict and control the cumulative nature of human development actions and their impacts on the environment (Duinker and Greig 2006; Benson 2003; Cooper and Sheate 2004; Bonnell and Storey 2000; Hirsch 1988; Beanlands et al. 1986).

Several authors have suggested that both conceptually and operationally CEA is not well-suited for inclusion in project-based EA (e.g. Duinker and Greig 2006; Antoiuk 2002; Kennett 2002). Specifically, CEA is limited by several characteristics typical of a project-based EA process. Among these characteristics are: (i) an ex post facto approach to assessing environmental impacts, including cumulative impacts (Fuggle 2005; Baxter et al. 2001); (ii) a heavy emphasis on economic and biophysical (natural) science issues and techniques (Noble 2006) over social, health, and cultural concerns; (iii) a truncated spatial and temporal scales (Joao 2002; McCold and Saulsbury 1996) rather than a scale of analysis commensurate with the scale of effects themselves; (iv) a focus on project-generated stress rather than on cumulative effects issues, that often unfold on a greater scale; and (v) a tendency to rely on technocratic, expert-oriented approaches to decision making (Bonnell 1997).

In short, project-based EA is neither well designed nor well positioned to deal with the complexity of cumulative environmental effects and often is only marginally able to address

simple cumulative effects pathways (see Noble 2006) when many other, often more complex effects and pathways, should ideally be taken into account. The result is a distinct need for an expanded and improved approach to CEA. These and other practical issues have led Canter (1999) and many others (see: Harriman and Noble 2008; Noble 2008; Fischer 2003; Dubé 2003; Bonnell and Storey 2000; Thérivel and Partidário 1996; Contant and Wiggins 1991) to suggest that SEA provides a better mechanism than project-level impact assessments for examining cumulative effects.

5.2.2 A New 'Home' for CEA: Regional SEA

Since the time that SEA began to be developed in earnest, approximately 15 years ago, arguments in support of SEA and CEA integration have been posited (see for example: U.S. CEQ 1997; Hildebrand and Cannon 1993; Wood and Déjeddour 1992). Certain key features of SEA are said to make effective CEA possible. In particular, SEA occurs early in the process of environmental planning decision-making, helping to set a course for the future and proactively avoid some of the pitfalls of development (Partidário 1996). Duinker and Greig (2006: 158) point out that "the focus of CEA is (also) explicitly on the future." In addition, SEA typically adopts a scope of consideration and assessment that is much broader than that of project-EIA, allowing the opportunity to detect and mitigate larger-scale environmental processes and effects (Thorhallsdottir 2007; Chaker et al. 2006), such as cumulative effects.

Many authors have gone a step further to suggest that CEA may be most effectively practiced within the context of regional or sectoral applications of SEA (e.g. Noble and Harriman 2008; Noble 2008; Dubé 2003; Bonnell and Storey 2000; Kennett 1999; Colnett 1991). Regional SEA, also known as 'comprehensive' or 'area based' SEA, evaluates the impacts of myriad PPP

and development activities upon a variety of valued ecosystem components (VECs) over a broad spatial and temporal scale. The spatial limits of a region are determined by natural boundaries such as a watershed or, less ideally, by ethnocentric boundaries such as political administrations or licensing agreements.

Regional SEA developed in response to shortcomings of area-wide project-EIA, such as the lack of vision or focus on alternative future development paths for the study area. In Saskatchewan, a regional SEA process was recently undertaken for the Great Sand Hills (GSH) region. Commissioned by the provincial government in 2002, the GSH Regional Environmental Study (RES) is the first regional planning exercise in Canada of this scale that combines strategic assessment and cumulative effects considerations in an integrated land use planning and impact assessment framework. The RES provides a large-scale assessment of regional development scenarios such that environmental, social, and economic values are addressed while maintaining a high degree of overall protection for the Great Sand Hills (GSH SAC 2007). The explicit pursuit of a preferred alternative development scenario sets the RES apart from non-strategic area-wide assessments of the past.

Regional SEA also developed in response to observations about the inefficiency of assessing impacts on a project-by-project basis. Spaling et al. (2000) for example, observed that incremental attempts at CEA were inefficient insofar as duplication occurred during the assessment of multiple projects in the same area over a short period while larger scale, strategic planning issues were still being missed. In the United States, this led to the development of programmatic environmental impact statements (PEIS) in the oil and gas industry which are highly technical documents that assess development alternatives, potentially significant impacts, and possible mitigation measures (U.S. Dept. Inter. 2001; Thérivel 1993). Once a PEIS has been

prepared for a region (e.g. a licensed offshore oil extraction area), subsequent developments within that region do not have to undergo a full scale EA thereby streamlining the regional EA process. While regional SEA of cumulative effects may reduce the need for subsequent assessment at the project level, or at least reduce or more clearly define the scope of project-based EA (see also Bonnell and Storey 2000), the programmatic form of SEA is very close to project-based EA and does not reflect the full potential of either SEA or CEA.

5.2.3 Anticipated Benefits

Regional SEA can potentially address a number of CEA-related issues beyond what is possible at the project level. It may be able address the additive and synergistic effects of repeated developments in the same ecological system; precedent-setting developments that stimulate other activities, especially in fragile environments; changes in the behaviour of ecological systems in response to increasing levels of perturbation; as well as encourage the adoption of comprehensive environmental objectives reflective of broad societal goals. Other, more tangible benefits may include the development of regional data bases; regional monitoring programs; regional thresholds, limits, and indicators; and, development parameters and policy guidance for downstream projects and decisions. The anticipated benefits of regional SEA are well documented (see for example Gryzbowski & Associates 2001; Noble and Harriman 2008).

What is largely missing from the literature is integration of these two themes: that SEA as a process is indeed suited to address cumulative effects and that 'good' CEA is only really possible beyond the project scale. In other words, while there is plenty of commentary on why regional applications of SEA provide the right context and level of assessment to address CEA, there is a lack of critical investigation and development of this assumed relationship. Similarly,

there is not yet sufficient evidence by way of demonstrated success in regional applications of SEA to support many of the claims to its particular benefits. Thus, the anticipated benefits of SEA-CEA integration are still a 'wish list' rather than results demonstrated by practice. By omission, the literature on SEA-CEA integration seems to ignore that in this case, in between a great idea and its potential benefits lies successful conceptual and methodological integration.

5.3 Methods

In the sections that follow the challenges that characterize SEA-CEA integration are explored. This discussion is based on a review of SEA and CEA literature and on the results of semi-structured telephone interviews with international SEA and CEA academic experts and practitioners. The international literature on SEA and CEA, along with literature on regional assessment and planning initiatives in Canada, served as an initial basis to identify interviewees. 'Snowball' sampling was used during interviews to identify additional interview participants. A total of 34 individuals were contacted, of which 23 contributed to the study. Telephone interviews ranged from approximately 35 to 70 minutes in length, but typically lasted about an hour. All data resulting from the interviews were coded using NVivo software for qualitative data analysis.

Participants were asked a series of semi-structured questions exploring several aspects of SEA-CEA integration, including: i) the nature of the ideal relationship between SEA and CEA; ii) drivers and expectations of a blended framework; iii) features of strategic assessment that may complicate CEA; iv) challenges related to a regional assessment context; and v) specific conceptual and methodological challenges. To provide context for their answers, interviewees were asked to make reference to SEA-CEA type frameworks they had been directly involved in

developing or applying. Interview questions were designed to try to identify and illuminate any perceived or observed complexities related to SEA-CEA integration and to ascertain motivations, conceptualizations of, and approaches to CEA in a strategic context. Emphasis was placed on lines of inquiry that framed CEA from a strategic perspective, although participants often framed responses in relation to experience in project-based EA and EA in general.

The institutional and administrative challenges to EA are extensively documented throughout EA literature and are believed to apply equally in the realm of strategic assessment. These challenges include: data management, availability, and communication; institutional coordination and legislative/regulatory support; effective public participation; efficiency in timing the assessment; establishing leadership and ownership of the process, and responsibility for implementation.

The discussion of conceptual and methodological challenges that follows attempts to capture observations based on the interviews and the 'negative space' around existing discussions, i.e. what is *not* being said, or perhaps overlooked. Both types of information have relevance in terms of understanding the main challenges to SEA-CEA integration and in terms of shaping the path to successful SEA-CEA integration in the future.

5.4 Conceptual Challenges

Three broad and overarching conceptual challenges to SEA-CEA integration emerged from the interview data: definitions and concepts; the means of linking benefits from regional applications of SEA to project-based EA; and the relationship of regional applications of SEA to regional planning and resource management. In general, there appears to be a certain level of confusion

around CEA itself regarding what it is, how it fits within SEA, and how an integrated framework will function to improve and add value to impact assessment.

5.4.1 Definitions and Concepts

The first challenge revolves around the current level of agreement on basic definitions and concepts. It has been broadly argued that, all effects are cumulative; that cumulative effects are inevitably addressed at a regional scale; and that CEA represents a better standard of practice in EA. If true, then at some point CEA should be fully integrated into SEA. At some point cumulative effects considerations should effectively 'disappear' into the process and no longer be treated as a special class of effects. This speaks directly to the issue of proficiency, the degree to which we truly understand cumulative effects, and our ability to address complex ecosystem interactions.

How proficient are we? Based on interview results it is safe to say, "not very." This statement is based on the multifarious and vague definitions of CEA provided by interview participants, indicating a lack of standard terminology. For example, when asked directly for their working definition of CEs, interviewees made statements such as: "I stuck with what was in Hegmann's Cumulative Effects Assessment Practitioners Guide," "I did a literature review, and came up with a definition applicable to my taste," and, "We more or less adopted the definition of the (Canadian Environmental Assessment) *Act*, which is 'in combination with projects or activities being carried out.'" Statements like these were common and indicate that precise working definitions around CEs and CEA are still elusive.

Further, with respect to some of the casework in which they had been involved, many interviewees indicated that cumulative effects are often poorly defined, very generally defined or

not even defined at all. One interviewee, speaking about the Crown of the Continent Manager's Partnership (a cross-border ecosystem management initiative among Alberta, British Columbia, and Montana) explained that a survey of partners was done to establish cumulative effects definitions. This resulted in such a wide range of answers that a working definition never emerged. Referring to the Great Sand Hills Regional Environmental Study in Saskatchewan (GSH SAC 2007), a member of the Scientific Advisory Committee to the project said "…at no point in this process did we whip out a definition of cumulative effects. Nor did we even discuss it." If these kinds of processes are designed to address regional cumulative effects issues above the project tier, a basic level of proficiency with CEA-related concepts and terms is expected. Such proficiency was distinctly lacking in the interviewees' opinion.

There are also varying interpretations of what SEA is and what it is ultimately meant to do. For example, some do not consider SEA an actual form of 'assessment' per se. One interviewee explains:

> Let's say when you're doing a planning exercise for a region, you say what is our vision for this region? How do you want this region to be? That certainly is far more strategic than at a project level, and at that level you're looking at the big connections and patterns, and asking, 'What do we value? What do we want to keep?' So in that sense you're planning for cumulative environmental protection, and you're recognizing that if you didn't have that vision and you didn't have that plan, you would nibble away, and cause cumulative impacts. (But) I don't feel comfortable with the idea of strategic assessment. There is just impact assessment, and it can be more or less strategic in nature, and it can be more or less sustainable in nature. It's a spectrum.

Another interviewee comments:

> We identified two different types of strategic environmental assessment, so strategic environmental assessment that really was related to EA, and another form which is really a planning process with elements of good EA embedded.

These kinds of statements about the different ways to define SEA sustain arguments already found in the literature that SEA is "one concept, multiple forms" (Verheem and Tonk 2000: 177). The current vagueness around basic CEA terminology, and the recognition of multiple interpretations of SEA beg the question: What exactly is being integrated when it is suggested that SEA is the best context for CEA? If both SEA and CEA are generally not well defined and not well understood, it would follow that there may be difficulty in successfully integrating these two concepts.

Some would argue that common definitions for SEA and CEA don't really matter and that it is more important to develop a common understanding of principles in support of the assessment process. However, it is now widely accepted that CEs are not well addressed at the project level and that part of the problem is that common standards of practice have not been developed. As one senior government EA administrator explains:

> The proponent of a project always puts their own spin on cumulative effects. Some of them refer back to the various guidance documents, and some of them don't do that very well. Some of them seem to take a bit of their own tack. The bottom line is, in my experience, I have never seen a cumulative effects section of an environmental impact statement that's been particularly well done. It's something that proponents do a poor job of almost invariably.

Thus, to advance CEA above the project tier, some basic level of proficiency with the 'nuts and bolts' of CEA must exist. Principles are simply not enough. As long as basic

definitions and concepts remain a problem, the level of proficiency needed to tackle cumulative environmental issues is not where it needs to be and it will remain largely out of reach to address the more complex types of cumulative effects that SEA may address.

5.4.2 The 'Trickle Down' Effect

There is an apparent assumption that the benefits of integration will 'trickle down' to project-EIA. One of most highly anticipated benefits of SEA-CEA integration identified by interview participants is that it should provide context for subsequent project-EAs. Nearly all interviewees expected regional SEA to "…be directly relevant to the projects under consideration" and yet, other interviewees commented that SEA is perhaps failing to deliver on its promise. For example, one academic expert with a long career in EA commented:

> …the SEA process in general has not delivered on its promise in theory and in principle to be a more effective mechanism for coming to grips with and addressing cumulative effects. You know there's been measurable progress with SEA over the last decade. It's been the big thing in terms of the evolution of impact assessment, but its capability of addressing the problems it purports to address and resolve is not only weak, it's inverse to the escalation of those problems. In other words the problems it purports to address are getting larger and larger. I think this is the biggest worry of all.

Considering these concerns is important to ensure that CEA performed in the context of regional SEA would directly inform project-related CEA. But how do we know that any benefits will trickle down to the project level if these processes are not explicitly linked?

In EA, there are enduring questions around the concept of 'tiering', and the degree to which it happens in practice. Despite this, it is generally assumed that "…if socio-economic and

environmental effects are properly considered on top of the decision making hierarchy in a publically accountable fashion there should be less friction and fewer problems at decision making levels further down the decision making hierarchy" (Fischer 2003: 162). In practice, tiering also takes place in the reverse direction. It is during project-based EA that significant policy issues are identified which may in turn lead to a strategic EA.

Explicit tiering should involve an upfront consideration of the relationship between regional SEA and project-based EA at the outset of a SEA process. One academic expert explains it this way:

> In my experience, whenever you try to integrate results across different spatial scales or across different disciplines, the only way that you can do that is if you try to understand beforehand how that integration will occur, what it is that project assessors need in a regional context for them to feel that that can relate to that, and what it is that people operating at a regional level think they might need or use from project assessment in order to better perform their regional analysis. Also what format, what is the nature of that information transfer? It's unrealistic to set out to do a regional SEA and to talk about creating a framework for project-EAs to relate to without going down to the project level and saying 'how do we make this work?'

A practitioner similarly notes that:

> …we need to more formally think about how we can connect (strategic CEA) to the project level. It's often difficult to trace that connection. SEA is fulfilling a particular role, but where possible it should try and think beyond to see what other benefits it might have further down at the project level, but I don't ever think that's going to be easy to do, and if in all cases whether it will be possible.

This observed need to link strategic and project-based EA echoes the work of Spaling and others (2000) who emphasize that truly effective CEA practice requires both project-based EA and management of cumulative effects at the regional scale.

It is therefore important to develop regional SEA and project-based EA as distinct from one another (each with intrinsic benefits) yet deliberately linked in ways that help to realize process efficiencies and synergisms whenever possible. If we expect CEA at the strategic level to provide context for project-based EA, explicit tiering mechanisms must be built in to the assessment process. SEA must be designed to provide context for project-based EA and project-based EA must correspondingly be designed to contribute to regional strategic initiatives.

5.4.3 Relationship to Regional Planning and Regional Resource Management

One of the most interesting and pressing challenges surrounding SEA-CEA integration involves defining regional applications of SEA in relation to its close cousins, regional planning and regional resource management. All three of these tools share fundamental features including a focus on: future conditions; strategic decision making; relationships among the various components of society and environment; and sustainable development. Yet, assessment, planning, and management are all distinctly different in terms of what they are meant to accomplish, who uses them, when, and why. While management consists of ongoing activities and actions as a means to efficiently deliver on project goals or commitments, planning is the higher-order process in which goals and objectives are set. Environmental assessment is typically a discrete evaluative mechanism designed to estimate the nature or quality of the potential effects of development options, options for development, and their alternatives.

In practice, this differentiation often becomes lost or confused. In many interviews, the terms planning, management, and assessment are used interchangeably, and many frameworks combine process and conceptual elements of all three. Interviewees had varying viewpoints on the relationship among strategic assessment, resource management plans, and regional planning exercises, as the following quotes from three different interviews demonstrate:

> …if I go back to (a case example from northern Canada), there's just no strategic planning done at all up there, and so one of the recommendations we have is that the government move on doing land use planning, and so again when I talk about strategic environmental assessment I'm also lumping in there good land use planning and that's a distinction that I don't see a lot of people making and I really think it needs to be made.

> I don't think you need a separate strategic environmental assessment process at all. If you are actually doing proper land use planning then you can embed in it some of the real good principles of EA. You can look at alternatives, and have the whole public consultation process and look at mitigation and all of those good things through land use planning, and it's just as good as any strategic SEA. It's probably better because there are processes under way with respect to land use planning.

> Regional SEA, as a subset of strategic assessment anyhow, is something that is likely to be variable depending on what you want in the region. Like you could say 'regional SEA' or you could say 'regional land use plan' or you could say a 'regional resource management initiative,'…

One of the primary difficulties is that environmental assessment, whether performed on its own, or as a supporting part of land use planning and management initiatives, is not always approached in a structured and systematic fashion and so it is not always easy to identify as an

'assessment.' Despite the fact that interviewees were contacted based on their environmental assessment expertise, the focus of discussion when explaining practice examples and related methodology was more likely to be on environmental planning and management considerations rather than environmental assessment methodology. On the whole, the research indicates that in the absence of mandatory SEA in Canada, SEA is not well understood, highly underutilized, and many of its potential benefits not likely manifested at this time. This echoes the results of a recent survey of Canadian EA practitioners regarding their use of SEA methods and tools (Aura Environmental Research and Consulting Ltd. 2009).

At present, the relationship between the different levels and types of assessment and, just as importantly, between SEA and broader regional initiatives in Canada is rather unclear. Environmental issues transcend EA and all of the other structures invented to understand and address them. To effectively address them, environmental assessment, planning, and management must be deployed in such as way as to maximize the unique contributions of each. This is of critical importance in Canada's future, as 'fuzzy' relationships only serve to confuse proponents and the public, weaken political support, increase process inefficiencies, and slow progress toward sustainable development goals.

5.5 Methodological Challenges

There are also a number of methodological challenges that accompany SEA-CEA integration, namely: the state of SEA methodological development; the need to shift to a systems perspective of environmental issues; and the challenge of 'aggregation' (i.e. the various means by which to define, measure, and express CEs issues in the course of an assessment process). While it is recognized that there are often methodological obstacles associated with any environmental

assessment exercise, this section addresses those challenges specific to the context of SEA-CEA integration.

5.5.1 State of SEA Methodological Development

The first methodological challenge involves whether SEA methodology is sufficiently developed to address complex cumulative effects. SEA can address not only additive effects, but also induced effects; synergistic effects; and global concerns such as biodiversity and climate change (Noble 2006; Bonnell and Storey 2000). In fact, the ability to address CEs is said to be a particular advantage of SEA (Thérivel 2004). However at the same time, concerns are expressed in the literature about the state of methodological development of SEA. For example, Thorhalldottir (2007) argued that SEA remains a vaguer concept than EIA with a tenuous methodological basis. Partidário (1996), ten years earlier, found that unknown or untested methodologies are among the most common difficulties reported by different countries practicing SEA. Other authors similarly indicate that the primary obstacle to general implementation of SEA is a lack of tools and a primitive methodology (Finnveden et al. 2003; Noble 2002; Stinchcombe and Gibson 2001; Fischer 1999). There has been a call for SEA to develop its own methodology, distinct from project-based EA methodology. One interviewee sums it up as follows:

> My sense is that there is a body of work in cumulative effects assessment that emerges from a scientific tradition that is linked to environmental assessment as you know, doing predictive science, and it's often done by people who are well aware of the limitations of predictive science even at the specific project impact level, and realize that we're in another world of trying to do it, but they're still thinking about how to be rigorous, which I'm not criticizing, I'm just saying that that's the tradition that that

> comes out of. Whereas the development of plans policies and programs, regulatory initiatives, tax plans, all that kind of stuff that we would call strategic,…most of that stuff it seems to me comes out of a quite different tradition.

Interviewees were specifically asked how they developed a practicable SEA methodology. One described it as "pulling a rabbit out of a hat"; several indicated that they started from scratch, and in another case, it was stated that "a methodology never fully emerged." In the latter case which involved a Canada-US ecosystem management initiative and management partnership, a collective effort was planned to develop a methodological framework. A computer model was to be a core part of the assessment however; a full methodological framework never did emerge. A large number of other process issues precluded it, including disagreements on whether the methodology was to be primarily a management framework or an assessment framework.

In spite of attempts to learn from previous similar cases, construction of methodologies to support regional SEA-type initiatives are hampered by a lack of existing 'good-practice' examples. Practitioners reported:

> We developed our framework in the absence of any other really good examples being out there. We couldn't find any suitable model case study at that time. We looked and we couldn't find anything.

> It (the methodology) was really…built from scratch. The ingredients were the principles.

> We were looking at previous works, but it wasn't that we came across one and said 'that's the framework we'll use.'

There is also a general lack of ease in addressing both complex and simpler forms of regional cumulative effects, evidenced by a very common tendency not even to define cumulative effects in practice:

> I think that if at the beginning we actually…took some time to really categorize our interpretation of (cumulative effects), it might have helped us avoid some of the bumps we experienced along the way.
>
> No, we didn't employ a typology (of cumulative effects or pathways). We would have needed to, but we didn't get there.
>
> I think we'd all be really happy if we could just to get to a stage where we could deal with additive effects.

The research suggests it is premature to assume that in practice, SEA methodologies are equipped to handle the complex task of CEA, although arguably sufficient or adaptable methods and techniques already exist that are appropriate to the task.

5.5.2 Required Shift to a Systems Perspective

One of the enduring challenges in EA is to build consideration for ecosystem dynamics into the science and the frameworks that are the foundation of assessment processes, particularly regional SEA. This stems from recognition that environmental impacts are likely to be expressed sooner at other levels of ecosystem organization than they are at the species level (Treweek 1999). Regional SEA has a scope of consideration that involves interactions between many types of environmental stressors and drivers of landscape change. Typical drivers of change in a region can include population dynamics, policy, economy, science and technology and cultural values,

as well as natural environmental processes (Seabrook et al. 2006). These drivers of change are not only influenced by localized developments, but also by global drivers of change. Therefore, regional SEA processes must not only reflect local trends but also take into account national and global environmental management issues such as sustainability and biodiversity, and policies to support them. This view is broadly shared among interviewees:

> I think so very much, that cumulative effects in a regional, strategic context means we must look at relationships and interconnections and that kind of thing. It is about looking at something as a regional entity and understanding what's going on within that.

> In project EIA, we've tended to look at moose, or a VEC; very specific elements of the environment, and I'm just thinking is there room to try and look more at VECs that reflect regional dynamics?

> You have to understand the system you're trying to manage. If you don't you have no basis on which to manage.

> …it's not just a shift in focus, it's probably a shift in mandate, and it may require a shift in capabilities, and theme design, and whole host of those kinds of things. The devil is in the details…

The shift to ecosystem awareness involves a shift away from the perception of environmental concerns as being specific (e.g. effects of pesticides, or particular environmental accidents, or protection of locally important features) to an awareness of their regional and global interconnectedness and the persistence of important relationships (Gunderson and Holling 2002; Holling 1973). In light of this, the unique context of *regional* and *strategic* environmental

assessment demands a shift in focus away from the immediate and direct effects of specific projects toward understanding regional social-ecological system dynamics, including limits, targets, and indicators of change. Canadian SEA and SEA-like frameworks are shifting to adopt an ecosystem perspective, a phenomenon partly evidenced by increasing focus on sustainable development issues (see for e.g.: GSH SAC 2007; Quinn et al. 2004).

In the interviews, many of the case examples cited demonstrated an awareness of the importance of multi-scaled partnerships, cross-border policy initiatives, and ecosystem management principles. There is growing conviction that it is necessary to address both stressors and effects in SEA as part of adopting an ecosystem perspective:

> I think basically it's a level of maturity. I think through (our latest) process we've developed some understanding of ecological effects, right. But the next step now is to really inform the public that as regulators, we're serious about protecting the environment, which means you have to have some bold action on the stressor side of things as well. It's not good enough to say, 'We'll keep managing the way we are until we see an effect.' The idea was always to do continuous improvement (to our actions), right?

There was also a strong degree of consensus among interviewees that the future of regional SEA will be tied to: identifying ecosystems limits, targets, and indicators; acceptance of uncertainty; and less focus on prediction and predictive science, particularly for SEA applied to higher-level plans and policies. The challenge that remains in SEA-CEA integration is to go beyond building regional institutional partnerships and communication mechanisms to build ecosystem science into the foundations of our assessment processes, particularly when it

involves a regional context. This requires a deeper understanding of ecosystem dynamics, and the factors that underlie and indicate the resilience and stability of social-ecological systems.

5.5.3 Aggregation

Finally, there is the challenge of aggregation and the role it should play in assessing cumulative effects. By definition, the term 'cumulative effects' implies taking an aggregate view of the environment. However, EIA methodology typically follows what is known as 'the problem isolation paradigm.' This is defined as the process of breaking problems down into their component parts, solving for part individually, and then recombining the various solutions into a plan that is regarded as the answer to the original problem (Charland 1996). In contrast, the field of ecology which strongly influenced the development of NEPA some 40 years ago, is predicated on the idea that the complex nature of the environment precludes a reductionist approach to problem solving. Yet we still often tend to frame problems and environmental analysis in this manner:

> What we tend to do is list the species that are there, and if we're working harder we'd say here are the effects on the individual species. And we don't look at them as an ecosystem of interdependent parts where one thing will ripple through the system. And so at the project level and any other level, you need to have it looked at as a system because that's what the effects will be, received by, translated by, magnified by and so forth.

Interview results reveal at least three distinct approaches to aggregation. The first approach is to 'sum up' individual effects such that a range of individual effects on a particular

valued ecosystem component (VEC) are evaluated and summarized into trend information. One interviewee explains it this way:

> Let's say you have a land use plan for a town of about 50,000 inhabitants, and the land use plan would suggest maybe 200 changes to existing land use. Well, you assess the impacts of these 200 suggested new uses for land, and based on your predictions, you can add those up. So, it's very simple, you just add up the impacts and then you say, well, so that's likely to be the cumulative impacts.

This is a useful approach if it indicates something important about the sustainability of a VEC. However, while this approach is relatively simple and therefore practicable, it reflects the same thinking that underlies the problem isolation paradigm.

A second approach is to build an assessment framework around what are perceived as cumulative effects issues in a region. For example, one interviewee described an approach to regional CEA developed to address further impacts of oil sands development in northern Alberta, Canada. This approach is a sophisticated issues identification and management exercise, supported by the best regional science available. It raises the profile of issues that are important to people and 'gets on' with managing them. However, investigation into the root causes and pathways of change is an important part of assessment because, ultimately, consideration for the sources of regional change is fundamental to a proactive, strategic approach, and can easily be lost in discussing the 'issues of the day.' The interviewee later acknowledged that, "Where we are at right now is the issues based approach has helped to some degree, but it hasn't helped in terms of being able to establish an overall regional effects assessment process that gets ahead of the pace of development." An issues-based approach to CEA needs the context of an overall the strategic vision.

The final approach is to assess the nature and quality of a specific suite of VECs that are cumulative by definition (e.g. habitat connectivity, habitat fragmentation, water quality). This type of aggregation is focused on VECs that are either indicative of ecosystem health or are somehow indicative of cumulative regional change. The focus is on defining and assessing 'regionally-relevant' VECs, which could be very useful in setting context for project EIA. For example, one interviewee described a CEA process that adopted surface disturbance as a broad measure of cumulative impact in a region:

> We sort of got caught in a trap of thinking about what are the impacts of this activity? How do we deal with the impacts of that? And someone said, 'What does it matter? It's all surface disturbance.' It was like a light bulb went off. Surface disturbance is surface disturbance. Sometimes we'll be able to delineate the source, other times we won't. So that's how we sort of conceptualized cumulative effects, as opposed to adding together VEC-based impacts.

At the same time, however, many interviewees cautioned that it is important to maintain balance in the assessment by including non-aggregated types of VECs—the types of VECs traditionally relied on in EA.

Each of these approaches represents a different interpretation of the term CEA and each in their own way attempts to present an aggregate view of environmental effects. Their individual merits and demerits may be debated. What the interviews indicate is that there is a need is develop an understanding of when aggregation tells us something important and when it obscures. It is critical to know what type of aggregation is appropriate in what circumstances. Aggregation, as an expression of the relationships among VECs and stressors, is perhaps *the* major challenge to SEA-CEA methodology.

5.6 Conclusion

Despite an apparent assumption that CEA in a strategic setting is simply 'the same as' CEA in a project-based EA setting, this paper demonstrates that the two types of assessment do not blend seamlessly or effortlessly. An investigation of relevant practitioner and academic experiences reveals there are several key conceptual and methodological issues that often accompany SEA-CEA integration. Although a broad, regional context provides boundaries that are inclusive enough for cumulative effects, it raises other aspects of assessment at a regional, strategic level that are complex and often difficult to remedy. Based on interviews results many attempts at regional, strategic CEA currently deliver results that fall short of expectations.

This research indicates that a regional, strategic context does create considerable complication in terms of the mechanics of considering cumulative effects—many of which have been seen before in regional applications of project-based EA—which warrants further attention to the intricacies of SEA-CEA integration. Further, the evidence presented indicates that just as the project-based EA community has in the past, the SEA community continues to struggle with the challenges that CEA represents. In the absence of better evidence, it is premature to assume that CEA *is* better practiced in SEA…although we likely would all agree that it *could* be.

There is consensus that regional SEA is an appropriate context and level at which to address cumulative effects, but there is much more to do in terms of proving that the two are a good fit. The arguments in support of integration must be better articulated and success in application must be demonstrated. In particular, there is an acute need to demonstrate effective CEA in applications of regional SEA. This requires continued dialogue, a concerted effort at training and education, and a broadening of the current EA mind-set beyond its traditional conceptual and methodological boundaries.

The nature and meaning of CEA need to be assessed above the project tier, and the institutional arrangements necessary to sustain CEA must be identified. Similarly, until SEA gains further regulatory support in Canada, Canadian practitioners may remain in a 'state of limbo' with no structured pathway toward improvement. It is time to move beyond criticisms of current practice of CEA and take a step back to clearly define our assessment processes, the relationships among them, what we want from them, and what we can realistically expect them to deliver.

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CHAPTER 6

Conclusion: Integrating Regional Strategic Environmental Assessment and Cumulative Effects Assessment

6.1 Introduction

Since its inception in the field of EA, CEA has remained a key challenge, both conceptually and methodologically. There is general consensus that project-based EA as a process is limited with respect to its ability to capture environmental issues beyond the project scale and at higher tiers of decision making (see for e.g. Fischer 2007; Duinker and Grieg 2006; Fuggle 2005; Noble 2005). Strategic environmental assessment, particularly regional applications of SEA, is suggested as a process much more commensurate with the scope and demands of CEA (Noble 2008; Dubé 2003; Bonnell and Storey 2000), however, this observation is not yet well supported by empirical evidence or through appropriate theoretical or conceptual development. The Canadian government has expressed interest in regional SEA as a mechanism to address regional cumulative effects issues and to contribute to sustainable development goals (Noble and Harriman 2008). At present, structured frameworks for regional SEA that include explicit consideration for cumulative effects assessment are lacking, and pressure to address cumulative environmental effects issues continues to mount.

The purpose of this thesis was to advance SEA by further developing its relationship to regional, CEA. This research agenda was based on the following objectives, namely to:

- Develop a typology of existing project- and strategic-based approaches to regional CEA based on assessment characteristics, functions, and performance expectations.
- Identify the key features of regional SEA and SEA-like case applications and frameworks in order to advance understanding of definitions; drivers; principles; conceptual and methodological approaches; strategies to integrate cumulative effects; and approaches to implementation.
- Develop a conceptual and methodological framework for regional SEA in Canada that explicitly integrates cumulative effects assessment.
- Identify the key challenges to SEA-CEA integration and to the future advancement of regional SEA both in Canada and internationally.

While it was possible to address these objectives, the research was limited in the following ways. First, due to the author's perspective as a social scientist and planner, the investigation focused mainly on issues identifiable from a social science perspective. Investigation of the integration of SEA and CEA would be enriched by also applying an applied science perspective, particularly to assessment methods and techniques suited to CEA. The research was also limited in that formal examples of plan-level regional-scale SEA in Canada are few, and informal examples are difficult to discern, especially in light of the similarities between regional planning, management, policy development, and assessment processes. In other countries such as England, formal plan-level examples of regional SEA are in abundance. Finally, the research was limited by the necessity to speak with informants primarily based internationally: telephone conversations necessarily replaced the preferred in-person approach to interviewing due to budget limitations. Although the interviews yielded a sufficient amount of quality data to support the analysis, interpretation of the interview data may have been enriched through person-to-person contact. In

the sections that follow, the main observations and conclusions emerging from this thesis are summarized, and the implications for future research directions discussed.

6.2 Regional CEA: One Concept, Multiple Approaches

Cumulative effects assessment (CEA) itself is said to represent a better standard of practice for EA (e.g. Ross 1998; Creasy 2002) yet notwithstanding more than two decades of international commentary, the advancement of CEA beyond the individual project scale, both spatially and strategically, has been slow to evolve (Damman 2002; Cooper 2003; Duinker and Greig 2006). In this thesis, regional CEA is conceptualized from two broad perspectives: project-driven approaches and SEA-driven approaches. A review of current literature and recent case examples suggests that each approach to regional CEA has its own merits that make it suitable to address particular types of cumulative problems at different tiers of assessment. Each can be expected to deliver different types of assessment results. The failure to fully recognize this 'one concept - multiple form' characteristic partially explains why the EA community has struggled in developing supportive methodological and institutional frameworks for regional CEA. This thesis suggests that many of the disappointments with CEA are not the result of EIA-driven applications per se, but rather the result of mismatched CEA frameworks and expectations.

It was anticipated that regional CEA could deliver impact analysis, as traditionally done in project-based EA. Before SEA gained prominence on the world stage, Stakhiv (1988) distinguished impact analysis from impact assessment by defining impact analysis as a technical process to characterize specific environmental effects and effects processes, in absence of any value judgments. Impact assessment, Stakhiv argued, is quite different: a process to apply value judgments or meaning, within a particular policy context, to the effects analysis. Arguably, CEA

interpreted within the context of regional SEA requires a combination of both approaches. While rigorous environmental analysis is still of paramount importance, regional SEA is 'outward focused,' and far more connected with ongoing planning and political processes than traditional project-based EA. Thus, some attempts at regional SEA resemble policy appraisal or institutional analysis while others more closely resemble the impact analysis processes typically performed at lower tiers for projects and programmes. This has created methodological confusion and perhaps mismatched CEA frameworks and expectations. This research suggests that a 'good' methodology for regional SEA that integrates CEA must be sensitive to both realities. In other words, methods and techniques in regional SEA must support both rigorous impact analysis and elements of policy and plan formation.

The typology (presented in Chapter 2, Section 2.3) further suggests that in regional SEA which is 'outward focused,' CEA must also be outward focused. In other words the CEA exercise must focus on connections and relationships among environmental components not typically considered through project-based EA. Traditionally, regional CEA simply meant a project-based approach to CEA applied to a larger, regional geographic scale. The focus of CEA remained on direct, usually linear, project interactions with specific environmental components. The typology suggests that the dimensions of CEA in a regional, strategic context are markedly different. In regional SEA, the region is usually defined by ecosystem interactions within a certain socio-economic and political context and thus the suite of impacts considered expands beyond direct, linear impacts to also include consideration for indirect, non-linear, synergistic, and higher-order effects (e.g. GSH SAC 2007). CEA becomes much more multi-dimensional, linking environmental media to elements of society and economy, as well as drivers of regional change or classes of environmental stressors. This represents a significant challenge

methodologically – one that it in some ways is qualitatively different from the methodological challenges in project-based EA – to bring order or focus to this highly complex view of environment-society interactions.

6.3 Lessons From Practice: Advancing SEA-CEA Integration

Internationally, frameworks for both regional and sectoral SEA have been under development for over a decade (see Thérivel and Partidário 1996; Fischer 2002; Dalal-Clayton and Sadler 2005). This research goes further to search out lessons from recent practice which can be brought to bear on the development of structured, regional SEA frameworks in Canada. The research findings suggest that the seminal contribution of regional SEA is perhaps setting a course and pace for future development in a region, particularly in areas that do not have a strong tradition of regional planning. This potential contribution of regional SEA is in sharp contrast to the traditional purpose of EA: to provide environmentally relevant information in support of a 'go/no go' decision regarding a proposed development (Harriman and Noble 2008). However, this thesis indicates that with respect to CEA, the SEA process becomes less about identifying and predicting the combined effects of individual stressors and more about defining regional environmental thresholds, assessing the state of regionally-relevant VECs, and setting targets and limits for future development based on a shared vision of desired future conditions. The focus is on opportunities and futures, rather than prediction and mitigation.

Also, there are different conceptualizations of cumulative effects and cumulative effects are often not explicitly defined or conceptualized in recent frameworks and applications. For example, some interviewees suggested that any broader scaled or scoped assessment will, by definition, capture cumulative effects without any special adjustment to assessment

methodology. In contrast, other interviewees suggest that a structured approach to CEA can be bypassed by simply focusing attention on regional cumulative effects issues. These tend to be publicly acknowledged, politically sensitive issues deriving from many sources of regional environmental perturbation. Still other interviewees view CEA as a scientific process to detect incremental effects that 'accumulate in an environmental receptor such as a water stream or air shed though processes such as sediment loading or emissions of airborne particulates. Each of these perspectives is valid, although it is not clear from current discussions of CEA in the literature that there is a multiplicity of perspectives.

All of the frameworks and related cases investigated in this thesis had what may be termed a 'strategic element' but just one framework was based on a structured SEA process. Thus, the research demonstrates that strategic assessment itself is also variously defined and approached in practice. For example, those interviewees who maintained that any future-focused assessment can be considered strategic, applied this sentiment even to project-based EA. Others, through their approach to methodological design, indicated that 'strategic' assessment means to prioritize management actions or make strategic decisions about issue management. The point is that SEA is as variously defined as CEA and, thus SEA-CEA integration begs the question: what exactly is being integrated?

The research into current practices also suggests that there are no 'cumulative effects issues,' just environmental issues that can be verified on an experiential basis. While these issues may or may not be significant from a scientific perspective, or may simply be symptoms of deeper issues, it seems that the purpose of CEA in SEA at least in part, will be to identify and address 'hot button' regional cumulative effects issues, understand the history and values around these issues, and suggest necessary shifts to improve the state of the regional environment. In

this way regional SEA becomes a forum to vet some of the concerns that previously confounded project-EA processes. At the same time, it is important to maintain structure and rigour in regional SEA frameworks as previously suggested (Noble 2006; Noble and Storey 2001).

6.4 Regional SEA: A Structured Framework

Conceptual and methodological frameworks represent a series of choices about how a problem is perceived and how its solutions will be pursued. This thesis set forth a proposed framework for regional SEA in Canada - one that explicitly accounts for CEA. The framework is based on the internationally accepted standard elements of SEA (Noble and Harriman 2008) with adjustments made to accommodate a regional scale of assessment and a strategic interpretation of CEA. The framework is divided into three phases: pre-assessment, assessment, and post-assessment. The steps in pre-assessment are to develop a reference framework; scope the regional baseline; and, identify regional stressors and trends. The assessment phase focuses on identifying strategic alternatives for the region expressed as potential scenarios for development; assessing the cumulative effects of each alternative scenario; and, identifying a preferred strategic alternative among the scenarios assessed. The final step, the post-assessment phase, includes identifying mitigation and management needs, which may lead to reconsideration of the chosen alternative; developing a follow-up and monitoring program; and, implementing, monitoring and evaluating the strategy over time. The assessment process is iterative in that it is meant to be revisited on a periodic basis: adjustments to the assessment or implementation strategies, which themselves are to be treated as 'regional experiments', may be made as new information becomes available or conditions change.

The key contribution of the research to this framework is not based in the reworking of the stages of a standard SEA process, as the basic steps in a regional SEA are the same as for any SEA. Rather, it is that the substance and focus of the assessment is reinterpreted to reflect a regional scale of assessment with an emphasis on regional cumulative environmental effects. Several "unique" elements of the framework emerged from the research and infuse the proposed framework including: deliberate tiering toward project-based EA, and horizontal and vertical linkages with other regional plan and policy making processes; greater emphasis on 'regionally-relevant' VECs and indicators; attention to regional drivers of change or classes of environmental stressors; assessment of broad future scenarios; and, emphasis on environment-society connections and interrelationships.

Perhaps the most significant implication of this framework is that it re-casts the process of impact assessment in a number of important ways. First, emphasis shifts from predicting direct, observable effects to probable broad shifts in regional environmental conditions. Second, the purpose of impact assessment is expanded beyond the production of an assessment report to influence a later decision, to also represent an important opportunity to define the regional environment – a 'place making' opportunity so to speak. Third, it set targets and limits for change that reflect both ecological thresholds and broad societal values and provide a touchstone for future project development. Finally, regional SEA re-casts impact assessment as a potential process to capture long-range views on environment and development and on slower moving ecological processes and systems, as these considerations are not commensurate with project-based assessment. Thus, R-SEA can represent a significant shift to established methodologies and mind-sets, requiring an expanded view of both the process of assessment and the regional environment.

6.5 Challenges to SEA-CEA Integration

Despite that there is a strong collective agreement that cumulative effects (CEs) are best addressed in a strategic context (e.g., Noble 2005; Dubé 2003; Sadler and Verheem 1996; Wood and Déjeddour 1992), little seems to have changed since Thérivel and Partidário's (1996: 17) observation that "…evidence for how this synergism is achieved has yet to be demonstrated with adequate methodologies and empirical examples." It is argued that the two types of assessment do not blend seamlessly or effortlessly. This thesis examined several conceptual complications associated with CEA in a strategic setting, including the wide variety of definitions and concepts for both SEA and CEA that currently exist; transferring benefits of regional SEA to project-EA; and a potentially confusing similarity between regional SEA and regional planning and resource management. Methodological challenges include the contested state of SEA methodological development; the need to shift to an ecosystem perspective of environmental issues; and, the challenge of aggregation or the means by which to define, measure, and express cumulative effects issues in the course of an assessment process. A key contribution of this research is to emphasize that SEA-CEA integration is not a simple process, nor is it easily achieved without careful consideration. These complications help to further explain the current dismay with regional CEA and suggest reasons why regional CEA tends to deliver results that fall short of expectations (e.g. Duinker and Greig 2006).

This thesis provides a basis to close the gap between 'a good idea' - that of regional SEA and CEA integration - and its anticipated benefits. Previously, much attention in the literature has been focused on either promoting such integration and its many anticipated benefits (e.g. Gryzbowski & Associates 2001). If some of the challenges raised in this research regarding such integration are addressed, then more of the benefits of SEA-CEA integration may be realized in

actual practice. The challenges raised herein also further underscore the need to manage expectations for regional SEA processes and what they can be expected to deliver (Harriman and Noble 2008). While regional SEA harbours great potential, SEA at the level of regional plans in Canada is not yet well developed. The current SEA Cabinet Directive applies to PPP proposals of federal departments and agencies but does not go further to include provisions for interdepartmental, interagency SEA, inter-provincial, federal-provincial or to impose SEA on private developers or proponents. Further institutional and regulatory support for SEA will be critical to advance agendas for regional SEA in Canada.

The research illuminates a broader methodological challenge or gap in SEA: whereas programmatic SEA and project-based EA have tended to rely on bio-physical, economic, and other applied-science methodologies that emphasize precise measurement, prediction, and process delivery efficiencies, policy-level SEA (particularly that which is not spatially explicit) tends to borrow methodologically from fields such as public administration, organizational theory, and policy analysis. The challenge in plan-level SEA and related CEA is not only to borrow intelligently from each these methodological traditions but also to borrow more heavily from fields relevant to regional environmental management such as such as civic science, ecosystem management, sustainability assessment, futures analysis, and systems analysis. Interviewees suggested that advancements in these fields continue to produce many important concepts and methodologies that may be adapted to assess environment-society interactions in R-SEA, and offer of wealth of ideas for the future advancement of methodology and practice.

6.6 Conclusions

Strategic environmental assessment was originally conceived as simply EA applied to PPPs based on the U.S. NEPA (1969). The methodological process of PPP assessment was envisioned as 'no different' than the assessment of projects. In some areas of the world this still holds true. However in many countries, including Canada, SEA has outgrown this relatively narrow definition of the concept, and today applications of regional SEA can bear a stronger resemblance to regional planning and resource management than any form of impact assessment. This strong similarity was noted by interviewees, making the selection of frameworks for review extremely difficult. Many practitioners had trouble defining their framework as an assessment, planning or management framework, and indeed upon closer examination, many frameworks could be classified as hybrids. Thus there is a challenge to distinguish regional SEA, not only in relation to the broader family of EA tools, but also in relation to existing and sometimes very established planning and management mechanisms that act upon regional development.

In a country as diverse as Canada, with regions of stronger and weaker traditions in regional planning, this task is both difficult and essential. It may be that the perceived value-added of regional SEA may not be as great in areas that already have well established regional planning process (e.g. Ontario) or regional resource management planning processes (e.g. British Columbia). However, in the many regions without strong centralized regional planning and management processes, SEA may be a very valuable process to establish a shared vision for future development and establish products and development targets that can serve as an important reference framework for further PPP, project, and community development. Advancing regional SEA in Canada will require some attention to sorting through the role of each of these mechanisms and clarifying the relationships among them. At the time of writing,

Alberta is making what may be considered the first formal attempt to do so, by defining a multi-staged process to guide regional resource development that includes an explicit regional SEA process set within the broader context of regional planning and program delivery.

Cumulative effects assessment represents a significant challenge to SEA methodology, and is particularly complex in regional applications of SEA. Work has begun to advance regional SEA methodologies in Canada but the practice is still very much in its infancy. Interestingly, SEA has been posited as a 'better' or more appropriate framework within which to address or capture cumulative effects issues which implies that perhaps CEA should finally become the domain of SEA. The underlying or implicit message within this dialogue is that CEA in project-based EA is a somewhat futile exercise. This research makes two important points in this regard. First, in certain significant ways, CEA is qualitatively different in a strategic assessment context to what it has been in project-based EA. For example, it is used to understand and influence the complex nature and pace of development rather than primarily on project approval. Second, if anything, regional CEA in SEA is potentially more complex than ever as the scope and the dimensions of the assessment widens considerably. Local, regional, and extra-regional influences are considered as well as the need to balance competing interests over longer periods and in the face of ever-shifting environmental baselines.

Thus, it is shortsighted to assume that SEA is better equipped to address cumulative effects. Conceptually, it may well be, but in practice, it will be challenging to develop effective methodologies, and supporting methods and techniques must be carefully adapted to the purpose. Until there is strong record of successful practice, it is premature to assume that SEA and CEA are easily integrated. To advance, regional SEA methodologies should draw from the most

successful elements of established practice within EA, but also continue to borrow from other fields of practice appropriate to the task.

Cumulative effects assessment continues to present many of the same challenges to SEA as it always has to project-based EA. There are still large envelopes of uncertainty; data and communications gaps; issues with maintaining levels of support, and developing community capacity; and the need for institutional and regulatory realignment to meet the environmental challenges of the day. Many of these issues are only intensified in a strategic context that deals in potential futures rather than the certainty of project proposals. Citizens are less likely to get involved in future-oriented processes that are not easily relatable to their more immediate concerns. Strategic environmental assessment therefore is not necessarily the answer to regional CEA that the EA community has perhaps been searching for, but rather it is but one tool in the broad assemblage of policy, planning, and assessment tools, albeit a tool with great potential to affect regional sustainable development. The search for efficacy for CEA in a project setting cannot be forgotten. Cumulative effects assessment in a project setting still serves an important purpose to predict and mitigate project impacts and ensure the protection of directly affected environmental components. The challenge is to define a reciprocal relationship between CEA at a strategic level and CEA at a project level. In this way, the cumulative impacts of development may be finally, more fully captured within the purview of EA.

While this research provides a structured framework for regional SEA that should be adaptable to many contexts and purposes, the research results also broadly suggest that two distinct methodological silos exist in SEA practice at present. ‘Assessment-based’ methodological approaches to SEA stress predictive science, quantification, modeling, a high degree of rigor, and the belief that uncertainty can be greatly reduced, if not eliminated.

Criticisms of this approach, based on interview results, include that prediction is a futile process as conditions are always shifting and that large envelopes of uncertainty will always exist despite filling knowledge gaps with educated guesses. Further, many values cannot be quantified; this approach is resource intensive; and often it progresses so slowly as to miss key decision windows. It is also criticized for promoting a compartmentalized view of environment. On the other hand, 'appraisal-based' methodological approaches to SEA tend to focus on discerning directions of change, characterizing relationships through heuristic modeling, integrating public values and viewpoints. These approaches are largely based on qualitative data, promote the acceptance of uncertainty, and are anticipatory rather than predictive. A number of interviewees suggested that results of appraisal-based SEA are often vague, value-laden statements; the results of which cannot easily be replicated, traced or supported. Appraisal-based approaches are also said to suffer from a lack of ground-truthing and rigorous analysis based on defensible science. In the case of regional SEA, due to its relationship to both project- and policy-level assessment, the author suggests there is a need to abandon extreme methodological positions to meet in the middle and to combine the best of both assessment-based and appraisal-based SEA to develop methodologies that are truly 'fit for purpose.'

Although it is possible to conceive theoretically distinct forms of EA as above, due in part to different perspectives on the role of science in EA, EA as a field of enquiry is also driven by legislative requirements and societal, political, and business (or economic) expectations. Thus, in practice, it is difficult to classify or identify the various forms of EA in any explicit theoretical manner since any one of them is likely to be a blend of several theoretical models. This may explain why the EA community remains fundamentally divided on the purpose of EA and the role of science within it. However, while project-based based models of assessment have

traditionally been strongly rational-scientific (Cashmore 2004; Weston 2000), the research demonstrates that real world decision making involves behavioural, cognitive, informational, and political constraints and rarely conforms to the rational model.

Based on the results herein, this is perhaps especially true for regional SEA. Regional SEA is a process designed and carried out with reference to its socio-economic and political context. As such, this research supports earlier work by Bartlett and Kurian (c.2000) who suggest that focus should be placed on the theoretical integration of the strengths of existing models. The results of this research suggest that regional SEA is an inherently civic science exercise but that it is also requires a solid foundation of applied science. In this way, regional SEA is fundamentally about connections and communication: from past to present to future; from operations through to plan and policy making; between individuals and institutions; and among environment, society, and economy. Its distinctive legacy perhaps shall be to inform decision makers of the broader, the slower-moving, the farther-reaching, and perhaps the more insidious currents of environmental change. It shall act as a mechanism to address regional-scale cumulative effects issues in tandem with regional planning and regional resource management, and suggest the connections and shifts that will help chart a path to sustainable regional futures.

To conclude, in order to further advance the integration of SEA and CEA, there is a need to pilot test structured frameworks and methodologies for regional SEA in Canada and to investigate and clarify the unique role of regional SEA in relation to regional planning and regional resource management in Canada. Regional SEA methodologies that reflect ecosystem management and sustainable development goals, and develop the role of citizen engagement and civic science in applications of regional SEA must be promoted. Support should be given to create and adapt methods and techniques to CEA in a regional SEA context, as well to promote

further SEA and CEA training among Canadian practitioners. With regard to methods and techniques, particular attention should be given to linking CEA with ecosystem analysis and management, and investigating means to achieve meaningful stressor and effects aggregation and disaggregation.

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